DOCUMENT RESUME

ED 404 372 TM 026 458

AUTHOR	Berends, Mark; And Others
TITLE	Identifying Students at Risk of Low Achievement in NAEP and NELS.
INSTITUTION	National Assessment of Educational Progress, Princeton, NJ.; Rand Corp., Santa Monica, CA. Inst. on Education and Training.
SPONS AGENCY	National Center for Education Statistics (ED), Washington, DC.
REPORT NO	DRU-1006-ED
PUB DATE	Jun 95
CONTRACT	RS90159001
NOTE	123p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Context Effect; Correlation; Grade 8; *High Risk Students; *Identification; Junior High Schools; *Low Achievement; *Predictor Variables; Regression (Statistics); Risk; Scores; *Social Influences; Student Characteristics
IDENTIFIERS	*National Assessment of Educational Progress

ABSTRACT

Data from the 1990 National Assessment of Educational Progress (NAEP) and the National Education Longitudinal Study of 1988 (NELS) are analyzed for eighth graders to distinguish the characteristics of low-achieving groups and the independent predictors of low test scores. Results provide a basis for evaluating the adequacy of the NAEP for these purposes. Analyses compared the bottom decile and quartile on the test-score distribution to the eighth-grade population as a whole in terms of simple univariate statistics. Logistic regression analysis was used to estimate the independent relationships between an individual's low achievement levels and social context characteristics in the NELS. Finally, several ordinary regressions and bivariate correlations among the social context measures were themselves analyzed to assess the adequacy of proxies in the NAEP. Findings demonstrate that several of the characteristics presently in the NAEP are useful for differentiating low achievers as a group from the eighth grade population as a whole. Analyses of the NELS show, however, that the NAEP currently lacks several measures important for the purpose. These include low family income, low levels of family closure, large families, single parent households, mothers who were young when they gave birth, greater school mobility, grade retention, lower grade point averages, low school mean income, and low levels of closure in the school as a whole. (Contains 12 tables, 17 figures, and 185 references.) (SLD)

****
*   Reproductions supplied by EDRS are the best that can be made   *
*   from the original document.   *
****

TM

TM

ED 404 372

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

RAND

Identifying Students at Risk of Low Achievement in NAEP and NELS

Mark Berends and Daniel Koretz

with Elizabeth Harris

DRU-1006-ED

June, 1995

Prepared for the National Center for Education Statistics
U.S. Department of Education

Institute on Education and Training

The research reported here was conducted for the Technical Review Panel (TRP) of the National Assessment of Educational Progress and was supported by the National Center for Education Statistics Contract No. RS90159001. The TRP is a joint endeavor of the Center for Research on Evaluation, Standards, and Student Testing (CRESST) at the University of California, Los Angeles; RAND; and the University of Colorado at Boulder.

TM026458

BEST COPY AVAILABLE

PREFACE

This report is intended for educators, researchers, and policymakers concerned with the adequacy of the NAEP for monitoring the achievement of students at risk of educational failure (i.e., low test scores). It analyzes the 1990 NAEP data for eighth graders and the eighth grade National Education Longitudinal Study (1988). Analyses of these data provide useful information for examining the distinguishing characteristics of low-achieving groups and the independent predictors of low test scores, and they provide a basis for evaluating the adequacy of NAEP for this purpose.

This project was conducted by RAND as part of the work of the NAEP Technical Review Panel (TRP) under contract to the National Center for Education Statistics, U.S. Department of Education. The TRP is a joint endeavor of the University of California, Los Angeles; RAND; and the University of Colorado at Boulder. The opinions presented in this report, however, are solely those of the authors and do not represent the position of RAND or the National Center for Education Statistics.

SUMMARY

This study is intended to assess the adequacy of the NAEP for describing students at risk of educational failure in terms of the social contexts in which they live (e.g., measures of students' family, school, and community environments). The specific focus is on low-achieving students, defined as those who score in the bottom quartile and decile of the achievement distribution. This distinguishes this study from the majority of research on social context and achievement, in that most research focuses on mean achievement levels. The study does not focus at all on the causes of low achievement because NAEP data are cross-sectional and thus poorly suited to supporting causal inferences.

While of value in their own right, the extensive description of the social context characteristics that place students at risk of scoring poorly on standardized achievement tests is motivated by a methodological concern: the frequent recommendations of researchers that NAEP and other large-scale surveys collect better data pertaining to students' background. Understanding who is at risk of educational failure is critical for designing effective educational programs and policies, and tracking the progress of successive cohorts of at-risk students is considered by many to be one of NAEP's most important functions. Changing NAEP in this regard would not be a simple task, however, and the descriptive information provided in this study is intended to evaluate both the NAEP's adequacy as currently operated and possible changes to it.

RESEARCH QUESTIONS

To assess the adequacy of the NAEP for reporting the test scores of the educationally disadvantaged, we addressed the following questions:

- What are the distinguishing characteristics of low-achieving students? For instance, what population-group, family, school, and community characteristics differentiate low-achieving students as a group from the student population as a whole?
- Which of these have independent relationships to low achievement apart from their relationships with other social context measures? For example,

are African-American students more likely to score poorly than whites from similar social contexts?

- Which measures presently in the NAEP are useful for identifying the educationally disadvantaged and for reporting trends in their performance? What measures should be added to better monitor students who have low scores?
- To what extent can measures currently in the NAEP serve as proxies for those that are omitted?

The analyses relied on a variety of statistical techniques to provide a thorough description of low-achieving eighth-grade students in NAEP and NELS. The individual student is the unit of analysis throughout most of these descriptions. Aggregate variables such as the characteristics of schools and communities are included in the analyses, but as attributes of individual students. School-level analyses that focus on the characteristics of schools serving a disproportionate number of low-achieving students would be a valuable extension of this work but is beyond the scope of the current project.

Because the NAEP has focused more on measurement of student test scores than on social context measures, some observers have suggested that it may lack variables important for describing students at risk of educational failure. In fact, our previous work for the TRP confirmed that the NAEP's social context measures are weaker than those in NELS. Since NELS contains richer measures of social context, we reanalyzed NELS data in this study to provide a benchmark to which the NAEP can be compared.

CONTRIBUTIONS OF THIS STUDY

This study is unusual in several important ways. First, and most important for the purposes of NCES, no studies of this sort have assessed the strengths and weaknesses of NAEP for describing at-risk students. Second, this study is one of the few that begins by defining groups of low-achieving or at-risk students -- in this case, those scoring in the bottom decile or quartile of the test score distribution -- and then analyzes the characteristics of those groups. Almost all studies of the relationships between social background and test scores describe the performance of students in *a priori* categories (e.g., African Americans and non-Hispanic whites) or model the effects of background variable means or other similar statistics. Third, this study is one of a relatively small number that considers both individual and aggregate characteristics jointly (see also Kaufman and Bradby, 1992).

FINDINGS FROM THE EXTANT RESEARCH LITERATURE

Although much of the existing research analyzes characteristics related to students' average achievement scores rather than the characteristics of students in defined, low-achieving groups, the findings of that research provide a context for the results of this study. Our review of previous research focuses on the relationship between social context and student achievement *after accounting for some other family, school, or community characteristics*. The social context characteristics strongly associated with lower test scores include poorer academic backgrounds, membership in a minority group (e.g., blacks or Hispanics), and lower socioeconomic status (usually some combination of parent education, income, occupational status, and possessions in the home). Several characteristics are moderately associated with low scores: larger family size, the mother having been a teenager when her first child was born, the child being primarily speaker of a language other than English, being a recent immigrant, students' lack of involvement in schooling activities, poor parenting styles in the home (e.g., authoritarian, overly permissive), school mobility, and a lack of connections with other adults that provide supportive social and material resources. Characteristics only weakly or inconsistently related to low scores include gender, living in a single parent household, and mother's labor force participation.

In addition to these individual and family characteristics, researchers have examined whether characteristics of schools and communities are related to learning. The estimated net relationships between institutional characteristics and achievement are typically not as great as the associations between individual characteristics and test scores because of the difficulty of establishing aggregate, contextual effects (Blalock, 1984). However, several school characteristics have been associated with low achievement scores, such as fewer opportunities to learn (e.g., poor instruction, placement in low tracks or ability groups), attendance at schools with lower average socioeconomic status, poor school climates, larger schools, and public school sector (vs. private). High minority enrollment and living in poor neighborhoods (e.g., high unemployment levels) or different regions of the country have shown only weak or inconsistent net relationships to test scores.

METHODOLOGY

The eighth-grade samples in the 1990 NAEP and the 1988 NELS were both analyzed. In the case of NAEP, we analyzed the samples that were administered mathematics or reading in the main assessment. Information about student demographic, family, school, and community characteristics were obtained through the student and principal questionnaires. In the case of NELS, we analyzed the mathematics and reading scores in the base-year sample and obtained information on family, school, and community measures from the school, teacher, parent, and student questionnaires. Whenever possible, family measures in NELS were based on parent reports rather than student reports to improve their reliability and validity.

The analyses involved a variety of statistical techniques. First, analyses compared the bottom decile and quartile on the test-score distribution to the eighth-grade population as a whole in terms of simple univariate statistics -- that is, one variable at a time. Second, logistic regression analysis was used to estimate the independent relationships between individual's low achievement levels and social context characteristics in NELS, holding constant a variety of other social context variables. These models estimate the probability that a student with given characteristics will fall into the bottom quartile or decile, which can then be compared to the overall population probability of scoring poorly (e.g., .25 for the bottom quartile). Finally, we estimated several ordinary regressions and bivariate correlations among the social context measures themselves to further assess the adequacy of proxies in NAEP.

RESULTS AND IMPLICATIONS FOR NAEP

Determining the adequacy of NAEP's family, school and community measures depends on the purposes for which they are used. In the present analyses, we examined two purposes: (1) describing low-achieving students according to this group's family, school, and community characteristics and (2) predicting low achievement scores based on students' family, school, and community characteristics. It is noteworthy that comparisons within databases -- whether between mathematics and reading tests or between the bottom quartile and decile -- were strikingly similar in both the univariate and multivariate analyses.

SIMPLE DESCRIPTIONS OF LOW-ACHIEVING STUDENTS

Simple univariate descriptions show that several of the characteristics presently in the NAEP are useful for the purpose of differentiating low achievers as a group from the eighth grade student population as a whole. Further analyses of NELS show, however, that the NAEP currently lacks several measures important for this purpose.

A number of social context measures available in NAEP substantially differentiate low-achieving students as a group from the population. ("Substantially" here means there is more than a five point difference between the percentage of students in the bottom quartile and the percentage of the entire population consisting of students from a given group.) For instance, over half of the group scoring in the bottom mathematics quartile in NELS is white, but about three-quarters of the NELS population is white. Therefore, although a majority of low achievers are white, whites are underrepresented in the low-achieving groups when compared to the population. In addition, family characteristics such as low levels of parent education distinguish low-achieving groups from the eighth grade population. School characteristics in NAEP also provide informative contrasts between low achievers and the population. For instance, students in schools with greater percentages of minorities, with a significant proportion of students on free or reduced lunch, with low average levels of parent education, and with less amounts of homework completed by the student body are over-represented in the low-achieving group.

A variety of other characteristics that differentiate low achievers from the eighth-grade population are absent from NAEP. These include low family income, lower levels of family closure (e.g., parents know very few of their child's friends), larger families, single parent households, and mothers who were young when they gave birth to the eighth grader, greater school mobility, grade retention, lower grade point averages, low school mean income, and low levels of closure in the school as a whole. NAEP could be significantly improved by adding these variables if the purpose of monitoring students at risk is simple description.

Both NAEP and NELS contain measures of region, and these show that low-achieving students tend to be over-represented in southern states compared to the population. Other than regional characteristics, both databases lack adequate measures of community or neighborhood environments, so it is difficult to assess whether these social contexts can provide instructive comparisons between low achievers and the population.

Several social context characteristics that were expected to provide contrasts between achievement groups but do not, include mother's labor force participation, students' individual homework levels, English as a second language, immigrant status, and school sector.

PREDICTING LOW ACHIEVEMENT SCORES

Because many of these social context measures are strongly related to each other, their univariate relationships with low achievement can be quite different from their independent effects on achievement when other aspects of social context are held constant. Therefore, not all of the measures useful for the purpose of describing low-achieving students are helpful for predicting the likelihood that individual students will score poorly on achievement tests. There is both overlap and inconsistency between the lists of measures useful for both purposes.

When one controls for a large number of social context variables, numerous variables that show strong univariate relationships with low achievement do not show a large independent association with low achievement. For instance, measures for single parent households, school minority composition, and percentage in the school on free lunch differentiated low-achieving groups from the population in the univariate descriptions, but they were not substantially independently related to low achievement scores. For example, students in primarily black schools are barely more likely to score poorly than students in primarily white schools once a variety of other variables (including the students' own population group) are taken into account. This finding contrasts the univariate descriptions which revealed sharp differences between the percentage of low achievers and the population who attend more racially and ethnically diverse schools. In some cases, the lack of independent relationships simply reflects the correlations among the many social context measures used in the analyses; once enough are included, the independent associations between many of them and low achievement will be small, even if there is in fact a causal link between them and achievement.

However, several demographic, family, and school characteristics presently in the NAEP continue to be related to low achievement scores, even after holding constant a large number of other social context characteristics. Population group membership and parents' educational attainment are substantially related to low scores both before and after other family, school, and community differences have been taken into account. Black students are much more likely to score poorly than Hispanics and especially whites from similar social contexts. In addition, while students whose mothers or fathers only graduated from high school have probabilities of low achievement almost equal to the population, eighth graders who have college-educated parents are much less likely to score in the bottom mathematics quartile even after other factors have been taken into account. Accounting for other differences in social context, there are striking differences between students in schools that have highly educated parents and those that do not. In addition, students who attend schools that assign greater amounts of homework are less likely to be low achievers.

Some of the social context variables that are included in NELS, but not NAEP, have substantial independent relationships with the probability of being a low achiever. The most important characteristics absent from the NAEP include measures for grade retention and immigration status. A student who is held back has about a forty percent chance of being a low achiever when other characteristics have been controlled. Immigration status, both of the student and the eighth grader's mother, are strongly related to test scores, but in the opposite direction of what is often assumed. For instance, controlling for other differences in social context, students who are immigrants (or whose mothers were born outside the U.S.) have a fifteen percent chance of scoring in the bottom mathematics quartile.

A number of other characteristics absent from the NAEP either are not statistically related to low scores or have only weak relationships to it. These include family income; family size; mother's age at birth of the eighth grader; family closure; school mobility; and school income, closure, and size. For instance, there is a only very weak relationship between scoring poorly in mathematics and family income after other differences in social context have been taken into account.

NAEP PROXIES FOR SOCIAL CONTEXT MEASURES

These findings raise the question: how adequate are the social context variables in NAEP as proxies for measures absent from it (e.g., income)? The answer differs according to the purpose of the NAEP. If the goal is only to predict the probability that a student will be a low achiever, our analyses suggest that a large enough number of the NAEP social context variables, taken together, are a fairly good proxy for omitted measures such as income. That is, adding an income variable to them will not dramatically change the predicted probability of scoring in the bottom quartile.

However, further analyses show that for other purposes -- for example, to answer the question, what are the achievement scores of poor students? -- the variables included in the NAEP do not provide an adequate proxy for income. For example, regressing the family income measure on the other social context characteristics available in NAEP results in an adjusted R2 of .31. This means that the other social context variables predict only about a third of the variance in income. Because family income has a strong unadjusted relationship with low test scores and a weak relationship once other factors are controlled, we conclude that the portion of family income that matters in predicting the probability of low achievement is the third of the variance in income that is related to the other social context variables in our full NELS model.

Among the school measures, the relationships are much higher, but even here existing NAEP measures do not provide good proxies for school poverty or school closure (i.e., social connections among families in the school). At most, two-thirds of the variance of these measures is explained by other demographic, family, school, and community characteristics that are available in NAEP. Because a large portion of the variance is left unexplained, the current NAEP does not provide sufficient proxies for these omitted school variables if the purpose is to identify the same groups of students.

In short, if the purpose of the NAEP is to predict low achievement scores, the extant NAEP is not affected by the omission of some particular social context measure. However, if the aim is to allow researchers and policymakers to identify the same low achieving students, then the NAEP currently contains inadequate proxy measures.

1. INTRODUCTION

Students are placed at risk for educational failure for many reasons, many involving students' experiences in their families, schools, and communities. Recent studies have focused criticisms on families and schools and their inability to effectively provide a quality education, especially for disadvantaged students. Some argue that we are in such deep trouble that the U.S. needs to systematically restructure the educational system, not just schools (see Murphy, 1991; Smith and O'Day, 1991). In fact, recent federal legislation was aimed at providing an overall vision to provide federal support for local state, community, and school systemic educational reform (Smith, 1995).

Understanding who is at risk of educational failure and why is critical for designing effective programs and public policy. The costs of not doing so are great. Natriello et al. (1990: 40) warn that "Failure to educate the educationally disadvantaged adequately may have catastrophic consequences for the social and economic well-being of this country." For example, there are high costs imposed on society -- forgone tax revenues, earnings, and economic output; greater welfare and medical expenditures; and greater costs of crime and incarceration (Levin, 1972, 1985, 1986, 1989; Catterall, 1985; McDill et al., 1986; Bishop, 1989). Since the educationally disadvantaged population may be expanding, these costs to society may soon become even more severe (Natriello et al., 1990; Pallas et al., 1989).

Because the meanings of the terms "at risk" or "educationally disadvantaged" are constantly shifting -- as is typical for rhetorical devices that are emotionally charged (Gans, 1990; Jencks, 1991; Wilson, 1991) -- it is critical to provide a definition at the outset. Generally, at-risk students are defined as those who are unlikely to succeed in the present school system because they do not have the experiences in the home, family, school, and community on which educational success is built (Levin, 1994). For the specific purposes of this study, we focus on low-achieving students, defined as those who score in the bottom quartile or decile of the achievement distribution. Therefore, this study differs from the majority of the research on student achievement that examines average achievement levels among different groups of students--for example, the many studies that explore the relationships between SES and mean achievement.

To better understand the indicators of risk related to student achievement, researchers have recommended that the National Assessment of Educational Progress (NAEP) and other large-scale surveys collect better data pertaining to students' social contexts (e.g., Grissmer et al., 1994). In fact, tracking the progress of successive cohorts of at-risk students is considered by many to be one of NAEP's most important functions. Changing NAEP in this regard would not be a simple task, however, and the descriptive information created in this study is intended to evaluate both the adequacy of the NAEP as currently operated and possible changes to it.

Specifically, the study is intended to assess the adequacy of the NAEP for describing students at risk of educational failure in terms of the various social contexts in which they live (e.g., measures of students' family, school, and community environments). It is a descriptive examination of both the institutional factors (e.g., school and community) and the individual characteristics (demographic and family) that place students at risk of scoring poorly on standardized achievement tests. The study does not focus at all on the causes of low achievement because NAEP data are cross-sectional and thus poorly suited to supporting causal inferences.

While separating the unique contribution of individual and institutional factors is a complex exercise (Sewell and Hauser, 1993; Gamoran, 1992), better data will contribute to a more thorough understanding of what factors are related to risk of low achievement. Such data will help avoid the traditional pitfalls of some educational research that adopts a "deficit model" of educational failure, placing the blame mainly within the student and promote work that examines how institutional characteristics are related to educational failure (Rumberger, 1994; Delgado-Gaitan, 1991; Wehlage et al., 1989; Bronfenbrenner, 1979).

RESEARCH QUESTIONS AND APPROACH

To assess the adequacy of the NAEP for reporting the test scores of the educationally disadvantaged, we address the following questions:

- What are the distinguishing characteristics of low-achieving students? For instance, what population-group, family, school, and community characteristics differentiate low-achieving students as a group from the student population as a whole?[1]
- Which of these factors have independent relationships to low achievement apart from their relationships with other social context measures? For example, are African-American students more likely to score poorly than whites from similar social contexts?
- Which measures presently in the NAEP are most useful for identifying the educationally disadvantaged and for reporting trends in their performance? What measures should be added to better monitor students who have low scores?
- To what extent can measures currently in the NAEP serve as proxies for those that are omitted?

Because the NAEP has focused more on measurement of student test scores than on social context measures, some observers have suggested that it may lack variables important for describing students at risk of educational failure. Indeed, our previous work for the TRP confirmed that the NAEP's background variable set is substantially weaker than that of NELS (Berends and Koretz, in press). Since NELS contains richer measures of social context, we reanalyzed NELS data in this study to provide a benchmark to which the NAEP can be compared.

---

[1] Consistent with our other work (Berends and Koretz, in press; Barron and Koretz, in press), we often use the term "population group" to refer to groups commonly called "racial" or "ethnic." We do this because the classifications in question are not unambiguously racial or ethnic. Rather, they are socially conventional categories that rest *in part* on racial and/or ethnic differences. For example, Americans who are of mixed white and black ancestry are generally classified as black as a matter of social convention. Similarly, some Caucasian South Asians are classified as "Asian," and many Hispanics with substantial Native American ancestry are conventionally classified as "white." We simply accept the socially conventional categories as given and use the neutral and less misleading term "population group" to refer to them.

We examine these questions using a variety of statistical techniques to provide a thorough description of low-achieving eighth-grade students in NAEP and NELS. The individual student is the unit of analysis throughout most of these descriptions. Aggregate variables such as the characteristics of schools and communities are included in the analyses, but as attributes of individual students. School-level analyses that focus on the characteristics of schools serving a disproportionate number of low-achieving students would be a valuable extension of this work but is beyond the scope of the current project.

The analysis consists of three steps: First, we extensively review the literature on the individual and institutional characteristics that place students at risk of low achievement scores. While any such review is selective, most of the studies included are those that analyze national data to examine the independent effects of demographic, family, school, and community measures on academic achievement (in most cases, average achievement). Second, we conduct our own analysis of NAEP and NELS to highlight those characteristics that distinguish low achievers from the eighth-grade student population as a whole. Finally, we jointly examine social context characteristics to ascertain which are important independent predictors of low achievement scores using logistic regression techniques.

CONTRIBUTIONS OF THIS STUDY

Although there have been many studies of the student characteristics that are associated with one or another measure of school failure, this study is unusual in several important ways. Most important for the purposes of NCES, no studies of this sort have assessed the strengths and weaknesses of NAEP for describing at-risk students. Almost all studies of the relationships between social background and test scores start with the background characteristics, either describing the performance of students in *a priori* categories (e.g., African Americans and non-Hispanic whites) or modeling the effects of background variables on mean outcomes. This study, in contrast, is one of the few that begins by defining groups of low-achieving or at-risk students – in this case, those scoring in the bottom decile or quartile of the test score distribution -- and then analyzes the characteristics of those groups. Moreover, when examining the effects of social context measures on student achievement, this study is unique in investigating the independent effects on low test scores rather than average achievement levels. This study is also one of a relatively small number that considers both individual and aggregate characteristics jointly (see also Kaufman and Bradby, 1992). Finally, it provides an extensive review of the research on social contexts that that place students at risk of low test scores for the specific purpose of improving measures in the NAEP.

2. FINDINGS FROM THE EXTANT RESEARCH LITERATURE

Although much of the existing research analyzes the average achievement of students rather than the characteristics of students in defined, low-achieving groups, the findings of that research provide a context for the results of this study. The following section briefly highlights several demographic, family, school, and community measures shown in previous research to be related to student achievement *after accounting for some other family, school, or community characteristics.*

INDIVIDUAL AND FAMILY CHARACTERISTICS

Much of the work on low-achieving students stresses the importance of individual factors, especially demographic and family characteristics. The following sections review the research on the relationships of test scores to population group, gender, academic background, family income, parents' educational attainment, single parent households, family size, age of mother at birth of the child, mother's employment status, immigrant status, and English as a second language.

Minority Population Group

Research has consistently shown that minority students are more likely to score poorly on standardized tests than nonminorities. While their are several explanations for why minorities continue to score poorly (Delgado-Gaiton, 1991, 1992; Wilson, 1987, 1991, 1993; Ogbu, 1979, 1989, 1992; Omni & Winant, 1994; McCarthy, 1990), minorities have made significant progress over the past twenty-five years in closing the minority-nonminority test score gap (Koretz, 1986, 1992; Linn and Dunbar, 1990; Smith and O'Day, 1991a; Grissmer et al., 1994; Mullis, Dossey, Campbell, Gentile, O'Sullivan, and Latham, 1994). While the gap has closed, the average achievement gap between blacks and whites remains large; it varies across tests, grades, and subject areas, but it is often about .75 of a standard deviation in NAEP and NELS, (Berends and Koretz, in press). If black and white students are held equal on a wide range of family, school, and community measures, the gap is reduced substantially. Yet, the adjusted gap remains about .40 of a standard deviation. Similarly, the unadjusted gap between Hispanics and whites is about .60 of a standard deviation, while the gap that adjusts for several social context measures is about .25 of a standard deviation (see Berends, Koretz, and Lewis, 1994)

Gender

Generally, girls do better in school than boys until puberty (Klein, 1985). Several argue that the learning environment and organization of junior high and high schools is better suited to boys than girls (Eccles and Hoffman, 1987; Steinkamp and Maehr, 1984), but the empirical evidence for such claims is lacking (see Mickelson, 1989). After the onset of puberty through the high school years, girls tend to outperform boys in verbal tasks, but boys score higher on tests measuring visual-spatial and quantitative skills. Studies that control for other family, school, and community factors find that high school girls score lower than boys on mathematics tests by about .10 of a standard deviation, score higher on writing by about .30 of a standard deviation, and do not differ from boys on reading or vocabulary tests (Gamoran, 1987). While the gender gap in writing achievement continues to favor girls over boys, the boys advantage in mathematics may be dissipating (see U.S. Department of Education, 1994).

Past Academic Success

One of the strongest predictors of future success in school is past success. Longitudinal studies that control for prior achievement levels (e.g., test scores, grades, retention in grade, mobility among schools) find students' past academic record to be a strong predictor of subsequent test scores (e.g., Alexander and Pallas, 1985; Coleman and Hoffer, 1987; Gamoran, 1987; Lee and Bryk, 1989; Hoffer, 1992; Gamoran et al., in press). Moreover, being held back in school and changing schools often is detrimental to student learning (Finn, 1989; Kaufman and Bradby, 1992). In fact, much of the debate about the true independent effects of family, school, and community measures on test scores centers, in part, on researchers' capabilities of fully accounting for past academic success (see Jencks, 1985; Slavin, 1990).

Family Income

In studies of academic achievement, family income is often incorporated into a composite defined as socioeconomic status (SES).[2] Some studies suggest that SES is the strongest predictor of student achievement than SES (see Coleman et al., 1966; Jencks et al., 1972, 1979; Gamoran, 1987; Lee, Bryk, and Smith, 1993). Socioeconomic status may be a proxy for a variety of family processes (ability, culture, tastes, stimulating environments, parenting styles and involvement in child's education, educational involvement).[3] Whatever the underlying factors, SES remains as strong predictor of student achievement.

The findings are consistent in the few studies that examine the relationship between achievement and family income by itself: student in higher income families tend to have higher achievement scores. For example, Hill and O'Neill (1994) find an increase of $10,000 per year is associated with an increase in scores of 2.4 percentile points. However, it may be important to measure income over a period of years since Hanushek (1992) finds that such a measure (i.e., "permanent income") is positively related to achievement, while current income measured at one point in time is not.

---

[2] Many studies that analyze data from the U.S. Department of education rely on composites in these databases for SES, usually an unweighted linear combination of parents' educational attainment, parents' occupational status, family income, and measures of home possessions. Such scaling, however, may introduce measurement error and thus attenuate associations of SES with student outcomes. In addition, data since the National Longitudinal Survey of the High School Class of 1972 (NLS-72), through High School and Beyond (HSB) and the base year 1988 National Education Longitudinal Survey (NELS) rely on Duncan's Socioeconomic Index (SEI) (Duncan, 1961), but the SEI is based on the 1960 Census. Therefore, the occupational status components of the SES composites in HSB and NELS are dated and of little use. (The 1992 wave of NELS, however, is the exception since it updates the SEI with the 1990 Census.)

[3] Examples of research on these various processes underlying parent educational attainment include: Plomin (1986) on ability; Bourdieu and Passeron (1977) and Bourdieu (1984) on culture and tastes; Kohn and Schooler (1983), Bradley (1985), Parcel and Menaghan (1990), and Menaghan and Parcel (1991) on stimulating home environments; Baumrind (1968, 1978) and Dornbusch et al. (1987), and Steinberg et al. (1989) on authoritarian, authoritative, and permissive parenting styles; and Stevenson & Baker (1987), Lareau (1989), Epstein (1990), Astone & McClanahan (1991), and Schneider and Coleman (1993) on parent involvement in child's education.

Educational Attainment of Parents

Like income, parents' educational attainment is an indicator of socioeconomic status and may be a proxy for several underlying family processes. Moreover, parents' education levels are also strongly related to student achievement in those studies that include the attainment measures separately, rather than subsuming it under the more global measure of family socioeconomic status (SES).

Students with mothers who have more years of schooling tend to score better on achievement tests than students who have less educated mothers. For example, previous analyses of NELS data show that students whose mothers graduated college score about .33 of a standard deviation higher in reading (.38 of a standard deviation in mathematics) than students whose mothers graduated high school (Grissmer et al., 1994; see also Hill and O'Neill, 1994).

There is also empirical evidence that father's educational attainment is associated with achievement even after other family characteristics are taken into account (e.g., family income and mother's education). For instance, Grissmer et al. (1994) find that students with college-educated fathers score about one-third of a standard deviation above those whose fathers did not go beyond high school. This finding was consistent across mathematics and reading tests in NELS and the National Longitudinal Survey of Youth (NLSY).

Single Parent Households

It has frequently been argued that children in single parent households may be shortchanged in terms of both money and time and thus may tend to perform more poorly in school (McLanahan and Sandefur, 1994). Research, however, is inconsistent in terms of the relationships between student test scores and the number of parents in the household.[4]

Several researchers find that living in a single parent household is associated with lower student achievement. Hetherington, Camara, and Featherman (1981) in their comprehensive review, find consistent, yet small, differences in achievement favoring children from two-parent families. Analyzing the mother-child data from the National Longitudinal Survey of Youth, Krein and Beller (1988) find that the negative effect of living in a single-parent family on achievement scores increases with the number of years spent in this type of family and is particularly influential during the preschool years.

These relationships may be due to other factors, however. For example, Milne, Myers, Rosenthal, and Ginsburg (1986) find that although the total differences are fairly substantial between students in single- and two-parent families (about nine percentile points), these differences can be explained by other family factors such as income, mother's employment, parental expectations, and parental help with homework. Others analyzing different data have found similar results (Desai et al., 1989; Hanushek, 1992; Mulkey, Crain, and Harrington, 1992; Hill and O'Neill, 1994; Grissmer et al., 1994)

Family Size

There is a substantial amount of research that shows that larger family size is associated with lower test scores (see Blake, 1989; Alwin, 1991; Hanushek, 1992; Hill and O'Neill, 1994). Blake's (1989) main hypothesis explaining these differences is that a greater number of siblings dilutes familial resources, thus lowering the achievement levels of students in such large families. The dilution occurs across a variety of familial resources, including parental time, emotional and physical energy, attention, and ability to interact with children as individuals, and in the amount of financial resources allocated to each child. Some have argued that family size effects are not significant because other parental characteristics have been ignored in research on family size (e.g., socioeconomic status, parental IQ, personality characteristics, perceptions of desirable qualities in children) (Lindert, 1977).

---

[4] This contrasts with the more consistent findings about the effects of household structure on other schooling outcomes (see McLanahan and Sandefur, 1994).

However, Blake (1989) argues that genuine family size effects exist, and finds that they are significant in many cases. Other research has supported her findings. For example, Hanushek (1992) shows that, as family size increases, the achievement growth of each child in the family falls (but at a declining rate). He also estimates that changes in family size that occurred over the past two decades help explain half or more of the aggregate changes in some student test score trends between 1965 and 1985, although this may be an overstatement (see Koretz, 1986).

Age of Mother at Birth of First Child

Young mothers may be in their teenage years, children themselves, unmarried, less educated, poor, and have little knowledge or skills to parent a young child -- all of which are related to lower test scores. Research on the effects of early childbearing on student achievement is mixed. Moore and Snyder (1991) find that mother's age at birth was less important as a predictor of test scores than the mother's score on a test of cognitive achievement (also see Hill and O'Neill, 1994; Desai et al., 1989). The association between early childbearing and low achievement scores has been fairly small in multivariate models, particularly when compared to other characteristics of the mother (e.g., income, educational attainment, and cognitive ability) (Grissmer et al., 1994; Moore and Snyder, 1991; Belmont, Cohen, Dryfoos, Stein, and Zayac, 1981).

Mother's Labor Force Participation

The relationship between maternal employment and student achievement has been the subject of debate. While some argue that maternal labor force participation decreases the amount of time available for each child and increases the stress in the family, others argue that employment enhances a woman's self-esteem, which transfers into fostering a better home environment (Hoffman, 1989). Although increased maternal self-esteem may explain part of the association between maternal employment and test scores, the increase in family income due to mothers working for a wage may be the key factor because of the increased financial resources that may benefit student learning opportunities.

The research on the correlates of mother's employment is inconsistent and also shows varying relationships depending on other variables. For example, Milne, Myers, Rosenthal, and Ginsburg (1986) find that mother's labor force participation is negatively associated with achievement; the more the mother works, the more negative the relationship. However, analyzing longitudinal data, Gottfried, Gottfried, and Bathurst (1988) did not find a negative relationships between maternal employment status and several different achievement tests. Others have found that the effects of mother's employment status differ according to the age of the child, with the effect being negative for very young children and negligible or slightly positive for older children (Desai et al., 1989; Blau and Grossberg, 1992).

Immigrant Status and English as a Second Language

Immigration and limited English proficiency are issues that have become increasingly important policy issues, especially because of their implications for public education (McDonnell and Hill, 1993; Vernez and Ronfeldt, 1991; Natriello et al., 1990).

The percentage of the U.S. Population who primarily speak a language other than English has increased significantly in the last ten years. For example, in 1979 about nine percent of the U.S. population primarily spoke a language other than English; in 1989, the percentage rose to twelve percent. The high levels of immigration in the past few decades contributed significantly to this increase (McArthur, 1993). Most of recent immigrants are concentrated in a few areas of the country, such as California, New York, Florida, Texas, and Illinois (McDonnell and Hill, 1993), so some schools serve populations in which the percentage of children whose primary language is not English is far higher than the national average.

When considering students at risk of educational failure, policymakers, researchers, and the public have focused their attention more on the Hispanic population group than on other immigrant population groups such as Asians. The reason for this may be that Asians typically have better educational outcomes, especially test scores, than Hispanics (Rumberger, 1987, 1994; U.S. Department of Education, 1994; Caplan, Choy, and Whitmore, 1991, 1992; Stevenson and Stigler, 1992).

The independent effects of immigrant status or language use on lower mean test scores is not well-established. For instance, Hill and O'Neill (1994) find that when mother's primarily speak a language other than English, the child's test scores tend to decrease, the relationship is explained by other family and community characteristics. This finding is consistent with others who have argued that other family and schooling factors are more critical to student learning than immigrant status and non-English use (Caplan et al., 1991; Delgado-Gaitan, 1991).

INSTITUTIONAL CHARACTERISTICS

Researchers have found it difficult to establish unambiguously the associations between students' school or community characteristics and test scores (Gamoran, 1992; Lee et al., 1993). The main reason for this is that most of the variation in student achievement scores lies within schools rather than between them, and only recently have methodological techniques advanced to separately estimate effects at the individual and school levels (see Bryk and Raudenbush, 1992).[5]

Often, researchers confuse the "school, an organization, with schooling, a process that individual students experience" (Bidwell and Kasarda, 1980, p. 402). While important, schooling processes, such as classroom instruction, are difficult to quantify with reliable and valid measures (Gamoran et al., in press; Hoffer and Moore, in press; Porter, 1991; Gamoran, 1989), so we limit our review to those studies that examine the relationships between student test scores and more global school organization characteristics – composition, size, sector, and climate. We also discuss research on the effects of students' neighborhoods and communities on school achievement.

---

[5] While muti-level modeling techniques (see Bryk and Raudenbush, 1992; Diprete and Forristal, 1994) allow researchers to model the separate of effects of individual-level and school-level variables, these techniques have not yet been sufficiently developed for estimating models with dichotomous dependent variables such as those analyzed in this study (e.g., bottom decile and quartile of the test score distribution).

Socioeconomic Composition

Schools with higher proportions of student from high socioeconomic backgrounds have higher achievement, higher graduations rates, and more college-bound graduates. This has been known for some time (Wilson, 1959; Conant, 1961). The question of interest, however, is whether these relationships reflect contextual effects above and beyond the individual-level relationships between SES and achievement. For example, one possible contextual effect would arise if schools with higher numbers of socially advantaged students provide environments that foster success over and above the effects of individual background characteristics (Gamoran, 1992).

This topic has received considerable attention over the past thirty years, and generally the research reveals that while students scores may be higher in schools that have greater percentages of higher status students, the net effect of school SES on achievement is not as strong as individual effects of SES on achievement (Gamoran, 1992). For example, the landmark Coleman report (Coleman et al., 1966) reports that schools with higher average socioeconomic levels (SES) also have higher student test scores, even after controlling for individual characteristics. Analyses of High School and Beyond show that school SES is strongly related to mathematics scores (Bryk and Driscoll, 1988; Lee and Bryk, 1989), but school SES does not have significant independent effects on other subject matter scores (Gamoran, 1987). Other studies also show a weak relationship between student achievement and school SES after accounting for individual characteristics (Alexander et al., 1979; Alwin and Otto, 1977).

Racial Composition

Another finding of Coleman et al. (1966) is that the achievement of minority students is higher in racially integrated schools even after controlling for individual and other school and community characteristics. However, similar to other school effects, minority composition is not as strongly related to student achievement scores when compared to the strong net effects of individual measures (e.g., population group and socioeconomic status). Gamoran (1987) finds that students in schools with a greater proportion of black students score worse on science and vocabulary tests; however, he finds the Hispanic composition of schools has no significant relation to the six tests administered in High School and Beyond data. More recently, Entwisle and Alexander (1992) show that, for younger children, family economic factors far outweigh the influence of the racial mix of the school. Generally, these findings are consistent with reviews of the short-term effects of school desegregation that reveals mixed, yet mostly positive, effects of school desegregation on minority students' achievement scores (Mahard and Crain, 1983; Crain and Weisman, 1972).[6]

School Size

There are two arguments about the relationship between school size and student achievement (see Lee et al., 1993). First, from the viewpoint of efficiency, some argue that larger schools are more cost-efficient in that they can spread costs over a larger pupil base and offer more resources (Chambers, 1981). Others, argue that activities in large schools are more formalized and specialized, which contributes to a climate characterized as bureaucratic, alienating, and isolating (Newmann, 1981; Bryk et al., 1990; Lee et al., 1993).

Some research has shown a negative relationship between school size and student test scores, apparently because school size influences achievement through other schooling processes. For example, Bryk and Driscoll (1988) find a negative relationship between larger schools and mathematics achievement, controlling for student and school characteristics. This association is explained by larger schools being more communal. That is, the smaller schools have shared values about the educational mission, a less diversified curriculum for students, a teaching staff that is committed and collegial, and teachers who go beyond their defined roles to help students learn and adjust socially (see also Bryk, , Lee, and Holland, 1993).

---

[6] Compared to the short-term effects of desegregation on achievement, studies of the long-term effects consistently show that desegregation is related to positive outcomes (see Wells and Crain, 1994).

School Sector

It is generally accepted that public schools are outperformed by Catholic schools; however, the magnitude of these effects and their implications are often the center of heated debate. One of the more balanced perspectives is Jencks' (1985), who states that students learn slightly more in the Catholic sector than the public over the last two years of high school; however, the magnitude is uncertain.[7]

In addition to the average effects of school sector on the general population of high school students, there is some research that shows Catholic schools benefit educationally disadvantaged students (Coleman, Hoffer, and Kilgore, 1982; Coleman and Hoffer, 1987; Lee and Bryk, 1989; Bryk et al., 1993). However, some argue that "the evidence that Catholic school are especially helpful for initially disadvantaged students is quite suggestive, but not conclusive" (Jencks, 1985, p. 134).

While the size of the effects of school sector are often debated, more recent research attempts to understand how these effects occur through the internal organization of schools (Bryk et al., 1990; Lee et al., 1993). A growing number of studies have compared the organization of private to public schools in terms of ability grouping and tracking, social relationships between teachers and students, parent involvement, and normative order of the school (Bryk and Driscoll, 1988; Lee and Bryk, 1988; Bryk et al., 1993). Many of the positive effects of the Catholic schools on disadvantaged students are explained by these organizational factors.

---

[7] This uncertainty is likely to remain since it is very difficult to control for problems of selection when comparing Catholic to public schools, despite various innovative attempts (see Goldberger and Cain, 1982; Coleman and Hoffer, 1987; Sander and Krautman, 1995).

Neighborhoods and Communities

Neighborhood or community characteristics may have an impact on schooling outcomes such as academic achievement (Corcoran and Danziger, in press; Brooks-Gunn et al., 1993; Garner and Raudenbush, 1991). For example, Garner and Raudenbush (1991) found that lower quality neighborhoods had a negative impact on student achievement. Their neighborhood measure included such factors as proportion of single parent and large households, unemployment rates for adults and youth, and overcrowding. However, others have not found significant neighborhood and community effects once other family and school characteristics have been taken into account (Gamoran, 1987; Hoffer 1992).

The mechanisms through which neighborhood effects on test scores operate are mainly speculative at this point because of the difficulty in specifying models that account for the family, school, and community contexts that influence student learning (Manski, 1994; Sewell and Hauser, 1993; Brooks-Gunn et al., 1993; Gamoran, 1992; Mayer & Jencks, 1989; Hauser, 1970).[8] One important reason for this problem is the lack of data rich enough to provide decent measures of family, school, and community factors. Often data are rich in two or three of these social contexts, but seldom all three. For example, most data from the Department of Education (HSB or NELS) provide good data on family and school characteristics, but they do not contain quality measures of neighborhood characteristics. By contrast, data often used to analyze poverty issues such as the Panel Study of Income Dynamics (PSID) or the National Longitudinal Survey of Youth (NLSY) provide an abundance of data on family and neighborhood/community characteristics. School measures, however, are severely lacking in these databases (see Danziger, Sandefur, and Wienberg, 1994; Maier, 1991).

---

[8] The mechanisms most often cited are (1) *contagion theories* suggesting that once peer influence passes a certain threshold detrimental effects on schooling outcomes result (Crane, 1991a, 1991b); (2) *collective socialization* theories hypothesizing that neighborhood role models and monitoring are important for child development (Coleman, 1988; Coleman and Hoffer, 1987; Wilson, 1987); (3) *competition theories* postulating that neighbors compete for scarce resources within the neighborhood; and (4) theories of *relative deprivation* hypothesizing that individuals evaluate their situation or relative standing compared to their neighbors (Meyer, 1970). The first two theories predict positive outcomes for children if the neighbors are affluent; competition or deprivation theories predict that affluent neighbors may contribute to negative outcomes (for further elaboration see Mayer and Jencks, 1989). The evidence for or against any one of these theories is far from clear.

Region of the Country

Students' schooling outcomes have differed by region of the country for some time (Duncan, 1968; Hauser and Featherman, 1976; Featherman and Hauser, 1978; Farley and Allen, 1987).

Like other schooling outcomes, test scores have differed by region with those students living in the south scoring slightly lower than those living in other areas of the United States. For example, NAEP has consistently shown lower scores in the south than in other regions (U.S. Department of Education, 1991). Some mutivariate analyses show that much of this regional difference may be attributed to family or school characteristics. For example, Grissmer et al. (1994) show that students living in the South score less than .10 of a standard deviation on mathematics test below student living in the Northeast, after controlling for various family characteristics. Gamoran (1987) finds that students in the South score more poorly on mathematics and vocabulary tests than students in the Northeast, but many of these differences disappear when school characteristics are taken into account.

SUMMARY: INDIVIDUAL AND INSTITUTIONAL CHARACTERISTICS

For our purposes, we summarize the extant research reviewed above in terms of what characteristics place students at risk of educational failure. The relationships between low achievement scores and the individual, family, school, and community characteristics are categorized according to whether they are strong, moderate, or weak or inconsistent *after controlling for some other family, school, or community characteristics*. While these categories are subjective, they are intended to illustrate the range of the relationships that have been established in the extant research.

Stronger associations with low test scores:

- membership in a minority group (e.g., blacks or Hispanics)
- poorer academic backgrounds (prior low achievement levels, held back in school)
- lower parental education levels
- lower family income
- lower parents' educational expectations
- lower socioeconomic status (usually some combination of parent education, income, occupational status, and possessions in the home)

More Moderate associations with low test scores:

- larger family size
- mother was a teenager at birth of first child
- primarily non-English speaker
- immigrant
- students' lack of involvement in schooling activities
- poor parenting styles in the home (e.g., authoritarian, overly permissive)
- school mobility
- a lack of connections with other adults that provide supportive social and material resources
- lower socioeconomic status school composition

- poor school climates (e.g., inconsistent educational vision, low expectations, a lack of school leadership, lack of school order and discipline, low levels of parent involvement)
- larger schools
- school sector (e.g., public schools compared to Catholic or other private schools)
- fewer opportunities to learn (e.g., poor instruction, placement in low tracks or ability groups)

Weak or inconsistent associations with low test scores

- gender (e.g., girls score worse on tests measuring quantitative and spatial reasoning skills, while boys score worse on tests measuring verbal ability)
- single parent household
- mother works full- or part-time outside the home
- greater minority school composition (especially for minority students)[9]
- poorer neighborhoods (e.g., high unemployment levels)
- rural or certain urban communities
- region of the country (e.g., South)

---

[9] Note that this list refers to characteristics that have associations with low test scores after accounting for other social context variables. On average, schools with high minority enrollments have substantially lower mean achievement than do other schools. However, the question addressed here is whether the minority enrollment of schools has an association with low scores after taking into account factors that include the population group of the students -- for example, whether African American students in schools with high minority enrollments have lower scores than do African American students with similar backgrounds but in low-minority schools.

3. DATA AND METHODS

We analyzed the eighth grade samples in the 1990 NAEP and the 1988 NELS. In the case of NAEP, we analyzed the samples that were administered mathematics or reading in the main assessment. The mathematics and reading samples are independent in the NAEP; that is, the same students in the main assessment do not take both the reading *and* mathematics test. We used information about student demographic, family, school, and community characteristics obtained through the student and principal questionnaires (for more details see Johnson & Allen, 1992).

In the case of NELS, we analyzed the mathematics and reading scores in the restricted-use base-year sample (for details see Ingels et al., 1990). In comparison to NAEP, NELS administered reading, mathematics, science, and history tests to the same sample of students. NELS obtained information on family, school, and community measures from school, teacher, parent, and student questionnaires. Whenever possible, we used family characteristics based on the parent responding to the parent survey rather than student reports to improve the reliability and validity of these measures (see Kaufman & Rasinski, 1991).

MEASURES IN ANALYSES

We examined a large number of measures related to low achievement in mathematics and reading, including demographic, family, academic record, school, and community characteristics. The definitions for the variables used in the analyses appear in Tables 3.1 through 3.4. Table 3.1 shows the measures that were common to both NAEP and NELS; Table 3.2 shows the language use characteristics in both databases, but operationalized differently; Table 3.3 presents additional measures available in NELS but not in NAEP; and Table 4.4 shows the variables that are unique to the NAEP.

Test Score Measures

The achievement measures are the bottom decile and quartile of the standardized mathematics and reading tests in NAEP and NELS. The 1990 NAEP reading test aimed at assessing different modes of comprehension for different types of texts (NAEP, 1989; Foertsch, 1992). The mathematics test in the 1990 NAEP aimed at assessing a variety of students' mathematical abilities such as conceptual understanding, procedural competencies, and problems solving abilities (NAEP, 1988; Mullis et al., 1991). The 1990 mathematics assessment asked questions in various content areas such as numbers and operations; measurement, geometry; data analysis, statistics, and probability; and algebra and functions. Reading performance was assessed in different reading domains such as reading a literary text, an informational document, and instructions to carry out a task. For a majority of the questions, students were required to give written answers. The reading test assumed that reading comprehension varies from informational (locating, comparing, and evaluating skills) to literary (constructing, examining, and extending meaning).

NELS also tested students in the areas of mathematics and reading (see Rock and Pollack, 1991). The mathematics test lasted longer, thirty minutes, and contained forty items required students to make quantitative comparisons and to provide answers to word problems, diagrams, and calculations. The reading test consisted of twenty-one multiple choice items that measured student comprehension and interpretation of five short passages that varied in length from one paragraph to a half-page. The eighth graders were given twenty-one minutes to complete this test. We relied on the test scores that corrected for guessing provided by the National Center for Education Statistics (NCES).

Table 3.1
Variable Definitions Consistent Across Both NAEP & NELS

Variable Name	Definition
Test Score Measures	
Bottom Mathematics Decile	Bottom Decile of Weighted, standardized Z-score
Bottom Mathematics Quartile	Bottom Quartile of Weighted, standardized Z-score
Bottom Reading Decile	Bottom Decile of Weighted, standardized Z-score
Bottom Reading Quatile	Bottom Quartile of Weighted, standardized Z-score
Demographic Characteristics	
Black	= 1, if student reports being black = 0, otherwise
Hispanic	= 1, if student reports being Hispanic = 0, otherwise
White	= 1, if student reports being white = 0, otherwise (reference group)
Other	= 1, if student reports being Asian or American Indian, etc. = 0, otherwise
Female	= 1, if student reports being female = 0 otherwise
Family Characteristics	
Mother's Education	
Less than high school	= 1, if education < high school graduate = 0, otherwise
High school graduate	= 1, if education = high school graduate = 0 otherwise (reference group)
Some college	= 1, if education = some college = 0 otherwise
College graduate	= 1, if education = college graduate = 0, otherwise
Father's Education	
Less than high school	= 1, if education < high school graduate = 0, otherwise
High school graduate	= 1, if education = high school graduate = 0 otherwise (reference group)
Some college	= 1, if education = some college = 0, otherwise
College graduate	= 1, if education = college graduate = 0, otherwise

Table 3.1 (Continued)

Variable Name	Definition
Family Characteristics (continued)	
Single Mother	= 1, if student lives in a single parent household, headed by mother = 0, otherwise
Mother's Labor Force Participation	= 1, if parent reports mother works full or part time = 0, otherwise
Academic Record	
Homework	Hours of homework per week
School Characteristics	
School Sector	
Catholic	= 1, school sector = Catholic = 0, otherwise
non-Catholic Private	= 1, school sector = private, non-Catholic = 0, otherwise
Public	= 1, school sector = public = 0, otherwise
School Mean Parent Education	Aggregated from higher of two parent-reported education levels
Percent Black	From school questionnaire
Percent Hispanic	From school questionnaire
Percent Free Lunch	From school questionnaire
School Mean Homework	Aggregated from student reported homework
Community Characteristics	
Locale Dummies	
Rural	= 1, if school located in rural area = 0, otherwise
Urban	= 1, if school located in urban area = 0, otherwise
Suburban	= 1, if school located in suburban area = 0, otherwise (reference group)
Region Dummies	
Northeast	= 1, if student lives in Northeast region = 0, otherwise
North Central	= 1, if student lives in North Central region = 0, otherwise
West	= 1, if student lives in the West = 0, otherwise
South	= 1, if student lives in the South = 0, otherwise (reference group)

Table 3.2
Variable Definitions That Differ Across Both NAEP & NELS

Variable Name	Definition
Language Use Characteristics	
NAEP	
Never	= 1, if student reports never using language other than English (reference group) = 0, otherwise
Sometimes	= 1, if student reports sometimes using language other than English = 0, otherwise
Always	= 1, if student reports always using language other than English = 0, otherwise
NELS	
Usually speak English	= 1, if student reports usually speaking English at home = 0, otherwise (reference group)
Usually speak Spanish	= 1, if student reports usually speaking Spanish at home = 0, otherwise (reference group)
Usually speak other language	= 1, if student reports usually speaking language other than English or Spanish at home = 0, otherwise (reference group)

Table 3.3
Additional Variables in NELS, not in NAEP

Variable Name	Definition
Family Characteristics	
Family Income	1987 dollars (0000s)
Number of Siblings	Total number of siblings, aged 18 or younger
Mother's age at child's birth	Age of mother at birth of eighth grader
Immigrant Status	
Mother is immigrant	= 1, if parent reports eighth grader's mother is immigrant = 0, otherwise
Student is immigrant	= 1, if eighth grader is immigrant = 0, otherwise
Family Closure	Composite of how many of child's friends parents know by name (range 0 - 6)
Academic Record	
Number of times eighth grader has changed schools	From parent questionnaire
Ever held back	= 1, if parent reports eighth grader was ever held back in school = 0, otherwise
GPA	Composite of student-reported grades since 6th grade in English, mathematics, science, and social studies from student questionnaire
School Characteristics	
School Mean Family Income	Aggregated from family income 1987 dollars (000s)
Eighth grade class size	From school questionnaire
School closure	Aggregated from family closure measure

Table 3.4
Additional Variables in NAEP, not in NELS

Variable Name	Definition
Community Characteristics	
Size and Type of Community	
Extreme rural	= 1, if school is located in small place and extreme rural = 0, otherwise
Low metropolitan	= 1, if school is located in big, inner city = 0, otherwise
High metropolitan	= 1, if school is located in affluent suburbs of big city (reference group) = 0, otherwise
Main big city	= 1, if school is located in big city and not inner city, affluent suburbs, or rural area = 0, otherwise
Urban fringe	= 1, if school is located outside city limits, but within urbanized area of a big city = 0, otherwise
Medium city	= 1, if school is located outside in a city with population between 25,000 and 200,000 = 0, otherwise
Small place	= 1, if school is located outside in a city with population less than 25,000 = 0, otherwise

Demographic Characteristics

Both surveys included items for identifying students' population group, or race-ethnicity. We created dummy variables to classify students into non-overlapping categories for African American, Hispanic, white, and other (mostly Asian and American Indians). Gender was also a dummy variable equal to one if the student was female.

Family Characteristics

For both mother's and father's education, we used dummy variables to represent the categories for less than high school graduate, high school graduate, some college, and college graduate or post-graduate degree. High school graduate was the reference category in the logistic regression analyses. Even though the original format for the NELS parent education measures included several more categories, these were collapsed into four to conform to the NAEP. Single mother and mother working (full or part time) were also included as dummy variables in NAEP and NELS.

Language use measures were also available in the two databases, but the questions were different on the NAEP and NELS surveys (Table 3.2). NELS asked students what language they used most often in their home. Dummy variables were created for the categories usually speak English (reference), usually speak Spanish, or usually speak some other language. NAEP asked students how frequently they spoke a language other than English. Dummy variables were created for never (reference), sometimes, and always.

Additional family measures in NELS, but not in NAEP, included family income, number of siblings, mother's age at child's birth, and mother's and student's immigration status (see Table 3.3). Family income is expressed in 1987 dollars (000s). Other continuous variables are age of mother at birth of eighth grader and number of siblings. A more precise measure of mother's age at child's birth would be the age of the mother at the birth of her *first* child, but NELS did not ask the parent responding to the survey this question. The number of siblings used in the analysis includes only siblings who were eighteen years old or younger living in the household.

The parent responding to the NELS survey gave information about whether the eighth grader was an immigrant and whether the student's mother was an immigrant. Dummy variables were created for both. Finally, family closure is based on parent responses to how many of their child's friends they know by name, ranging from zero to six. It is intended to measure the social ties, or "social capital," within the family and community surrounding the school (for arguments for this measure see Coleman, 1988; Schneider and Coleman, 1993).

Academic Record

Both NAEP and NELS included information on students' academic record as indicated by the hours of homework per week spent on homework (Table 3.1). Even though the original item in NAEP asked students the hours of homework they had each day, this was recoded to measure homework per week.

NELS also included additional information on students' academic records (see Table 3.3). School mobility is a parent-reported measure of the number of times the eighth grader changed schools since entering the first grade. Retention in grade is from the parent survey and measures whether or not the eighth grader was ever held back in school. Grade point average (GPA) is a composite based on student reports of their grades since sixth grade in English, mathematics, science, and social studies.

School Characteristics

Several school measures were similar in both NAEP and NELS. We measured school sector with dummy variables for Catholic, non-Catholic private, and public schools. School composition variables included the school mean parent education, the percentage of the student body that is black, the percentage Hispanic, the percentage of the students receiving free or reduced lunch, and the average hours of homework completed by the students in the school each week. School parent education was aggregated from the higher of the two parents' education levels reported by the student in NAEP and the responding parent in NELS, and school homework was based on aggregating the student responses in both databases about the hours per week they spent on homework. The other school composition measures in NAEP and NELS were based on the school administrator survey.

Further school characteristics available in NELS, but not NAEP, included school mean family income, eighth grade class size, and school closure. The school income and closure measures were created from aggregating the parent measures within the school, and class size was taken from the school administrator survey.[10]

Community Characteristics

Community characteristics common to both NAEP and NELS included region of the country and locale (i.e., urban, rural, or suburban). Dummy variables were created for both region and locale; the reference categories were South and rural, respectively.

NAEP also include a measure for size and type of community (STOC) that is based on information from various sources and various levels of aggregation (for details see Berends, Koretz, and Lewis, 1994; Johnson and Allen, 1992). For our purposes, we created dummy variables for the various categories, including extreme rural, low metropolitan, high metropolitan (reference category), main big city, urban fringe, medium city, and small place (see Table 3.4). While this measure is frequently used in NAEP reports of student scores and is a strong independent predictor of test scores, its validity has been questioned (see Berends et al., 1994; Lipmann, 1993). For example, because the occupational profiles contained within STOC are based on principal' reports that may not be accurate and because the NAEP sample is partitioned into STOC categories that are inconsistent with other representative data, substantive conclusions based on the STOC variable are problematic.

---

[10] Lee and Smith (1993, p. 171) in their analyses of NELS for a different purpose point out that because of the various configurations of middle-grade schools e.g., K-8, K-12, 6-8, 7-9, etc.) eighth grade enrollment is useful measure of size. They also report that the correlation between eighth grade enrollment and school size is .83.

APPROACH

Determining the adequacy of NAEP's family, school and community measures depends on the purposes for which they are used. In the present analyses, we examined two purposes: (1) describing low-achieving students according to this group's family, school, and community characteristics and (2) predicting the likelihood that individual students with certain family, school, and community characteristics will score poorly on achievement tests. Our analysis of the latter purpose differs from the majority of existing research that examines the independent relationships of social context to mean achievement levels rather than low achievement levels (e.g., bottom quartile or decile).

One set of analyses compared the bottom decile and quartile on the test-score distribution to the eighth-grade population as a whole in terms of simple univariate statistics – that is, one variable at a time. In addition, we estimated the correlations among several social context measures at the individual level and school level.

Logistic regression techniques were used to estimate the independent relationships between individual's low achievement levels and social context characteristics, holding constant a variety of other social context variables. These models estimate the probability that a student with given characteristics will fall into the bottom quartile or decile. By controlling for other variables, one can estimate the adjusted probability of low achievement for a specific variable of interest. For example, one can estimate the probabilities that black and white students score into the bottom quartile, accounting for other differences in social context.[11]

---

[11] The logistic regression (logit) model is the appropriate method when the dependent variable is dichotomous, since it restrict the value of the predicted probability to range between zero and one. The model relates the bottom mathematics quartile of the i^{th} individual, Y, to a vector of social context characteristics for that individual, x_i. The assumed relationship is:

In the logistic regressions, we included missing value dummies for all cases with missing data on the individual and family variables. In each case, the missing value was replaced with the weighted mean for continuous measures and the weighted mode for categorical variables. Because there were so few students missing information on school and community characteristics (less than one percent of the sample), these cases were deleted from the analyses. In the case of missing parental education in NELS, we first substituted the education of the other parent, then the student report of parent education, and then the weighted mean of the variable itself for the remaining missing values. Replacing missing values for individual variables preserved the large sample sizes of the databases and prevented us from throwing out cases that had important non-missing information. In addition, explicitly controlling for the missing data allows us to see whether these individuals differ from the non-missing cases in some systematic way. A sensitivity analysis was performed utilizing only the cases with all data present, and results were substantially the same as those obtained by including missing data variables.

$$\begin{aligned} Y_i &= \rho(x_i) + \varepsilon_i, \\ P(x_i) &= P[Y_i = 1 \mid x_i] \\ &= 1/1 + e^{(\beta_0 + \Sigma\beta_j x_{ij})} \end{aligned}$$

where $P(x_i)$ = probability of scoring in the bottom quartile for specific eighth grader i,
x_{ij} = values of the explanatory social context variable j for individual i,
β_j = estimated coefficient for the x_j, and
β_0 = estimated constant term.

We present the maximum likelihood estimates in Appendix B and the probabilities in Chapter 5.

4. DISTINGUISHING CHARACTERISTICS OF LOW-ACHIEVING STUDENTS

Simple univariate descriptions of low-achieving students reveal that several characteristics presently in the NAEP are useful for the purpose of differentiating low achievers as a group from the eighth grade student population. However, analyses of NELS show that the NAEP currently lacks several measures important for this purpose.

Before reporting the detailed results, it is important to note that comparisons within databases – whether between mathematics and reading tests or between the bottom quartile and decile – were strikingly similar. For example, the percentages of students in the bottom quartiles belonging to each population group (black, Hispanic, and white) were similar to the corresponding percentages in the bottom deciles. The similarity of the bottom decile and quartile is surprising; if scores are approximately normally distributed and have roughly similar variances in each group, one would find that lower-scoring groups are more over-represented in the bottom decile than in the bottom quartile. Because of these similarities across cut-points and subject areas, we will often discuss only one set of results rather than all four. A complete set of results appears in Appendix A.

Table 4.1 provides a summary of the characteristics that substantially differentiate between the group of low-achieving students and the eighth grade population. "Substantially" here is arbitrarily defined as more than a five point difference between the percentage of students in the bottom quartile and the percentage of the entire population consisting of students from a given group. The table contrasts the bottom quartile to the population as a whole in mathematics, based on analysis of NELS; variables not presently available in the NAEP are shaded. Other contrasts between low-achieving groups (e.g., bottom decile vs. population), between tests within databases (mathematics vs. reading), and between databases (NAEP vs. NELS) are quite similar, so Table 4.1 provides an illustrative summary of the more detailed analyses that follow.

Table 4.1
Percentage of Mathematics Achievement Groups in NELS with Certain Social Context Characteristics

	Bottom Quartile	Population	Difference
Demographic Characteristics			
Black	26%	13%	-13%
Hispanic	15%	9%	-6%
White	54%	73%	19%
Family Characteristics			
Mother's Education High School or Less	58%	43%	-15%
Father's Education High School or Less	61%	43%	-18%
Mother is Single Parent	22%	16%	-6%
Family Income < $15,000	37%	20%	-17%
More than Two Siblings	42%	34%	-8%
Mother's Age at Child's Birth ≤ 20	20%	13%	-7%
Family closure ≤ 2 of Child's Friends Known by Parent	38%	16%	-22%
Academic Record Characteristics			
Changed Schools More than Once	39%	32%	-7%
Ever Held Back	41%	19%	-22%
GPA < C Average	31%	16%	-15%
School Characteristics			
School Percent Free Lunch > 50%	25%	16%	-9%
School Percent Minority > 25%	56%	37%	-19%
School Mean Parent Education 13 Years or Less	37%	23%	-14%
School Mean Homework < 5 hours/week	45%	37%	-8%
School Mean Income < $25,000	36%	20%	-16%
School Mean Closure ≤ 2	32%	20%	-12%
Community Characteristics			
South	44%	36%	-8%

Notes: Difference is equal to the percentage in the population minus the percentage in the bottom quartile. The highlighted rows indicate variables in NELS but not in NAEP.

BEST COPY AVAILABLE

In general, a wide array of social context measures for population group, family, academic record, school, and community distinguish low achievers from the population. For example, while a majority of low achievers are white, whites are under-represented in the low-achieving group when compared to the population. Fifty-four percent of the group scoring in the bottom mathematics quartile is white, but 73 percent of the NELS population is white. In addition, minorities are over-represented in the low-achieving group, especially black students.

Family characteristics that differentiate students at risk of low achievement when compared to the population include low levels of mother's and father's education, single mother households, low family income, large families, mothers who were young when they gave birth to the eighth grader, and low levels of family closure (e.g., parents know few of their child's friends by name). Family income, family size, age of mother at birth of child, and family closure – while important – are absent from NAEP.

Students' academic records are important for comparisons between the group of low achievers and the population. Students who changed schools frequently prior to eighth grade, who were held back, and who had below-average grade point averages were over-represented in the low-achieving group when compared to the population. None of these measures is in NAEP.

In addition to these individual characteristics, school characteristics are useful for describing the low-achieving groups of students. When compared to the population, students in schools with greater percentages of minorities, low socioeconomic status, and lower levels of homework and closure are disproportionately represented in the low-achieving group. For example, just over one-third of the population attends schools in which more than 25 percent of students are minority, but 56 percent of students in the bottom quartile attend such schools. In addition, 36 percent of low-achieving students are in schools with average family incomes less than $25,000 (1987 dollars), as compared to 20 percent of the population, a 16 point difference. Other school composition characteristics – such as a greater percentage of students on free lunch, low school mean parent education, low levels of homework, and low school closure (e.g., on average parents in the school do not know their children's friends) -- substantially distinguish between the low-achieving group and the population. Two of these school-composition variables, school mean income and closure, are presently lacking in the NAEP.

While both NAEP and NELS lack adequate measures of community characteristics, both include measures of region, which is useful for distinguishing the low-achieving groups from the population as a whole. Low-achieving students tend to be over-represented in southern states compared to the population. Thirty-six percent of the NELS population is located in the South, for example, but 44 percent of students in the bottom quartile were in the South.

Measures for urban locale (e.g., urban, rural, and suburban areas) provide inconsistent contrasts between groups both within and between databases, so they are not useful for describing students at risk. In NAEP, which contains a measure for size and type of community (STOC), low-achieving students are under-represented in the affluent suburbs (i.e., "high metropolitan" category of STOC) compared to the population. However, the validity of STOC is questionable, so using it to describe students at risk is ill-advised. In short, because both databases lack good measures of neighborhood and community characteristics, it is difficult to know whether these social contexts are important for describing students at risk of low achievement. Future research should consider this issue.

Other characteristics that were expected to distinguish low-achieving eighth graders from the population, but do not, include mother's labor force participation, students' individual homework levels, and school sector (private vs. public). In addition, low-achieving students did not strongly differ from the population according to whether English was the primary language spoken in the home. NELS also included questions that asked whether the parent and the student were immigrants. Neither of these measures differentiated substantially between low achievers and the population although some minor differences do appear. Finally, while gender differentiates low achieving groups from the population in reading (i.e., females are under-represented in low-achieving groups), there are not gender differences in mathematics.

The following sections provide in detail the results from our analysis of NAEP and NELS. Various sets of social context measures are discussed in turn, including measures for demographic, family, language use and immigration status, academic, school, and community characteristics. Rather than present all of the comparisons between subject areas and between databases, we highlight those findings that are informative and note differences that occur.

Demographic Characteristics

Although the majority of students who are at risk of low achievement are white (because most of the student population is white), whites are under-represented in the group of low-achieving students. In NAEP, about 60 percent of students scoring in the bottom reading quartile are white (see Figure 4.1), and 46 percent of those in the bottom mathematics quartile are white (see Figure 4.2), while about 70 percent of the NAEP sample is white.

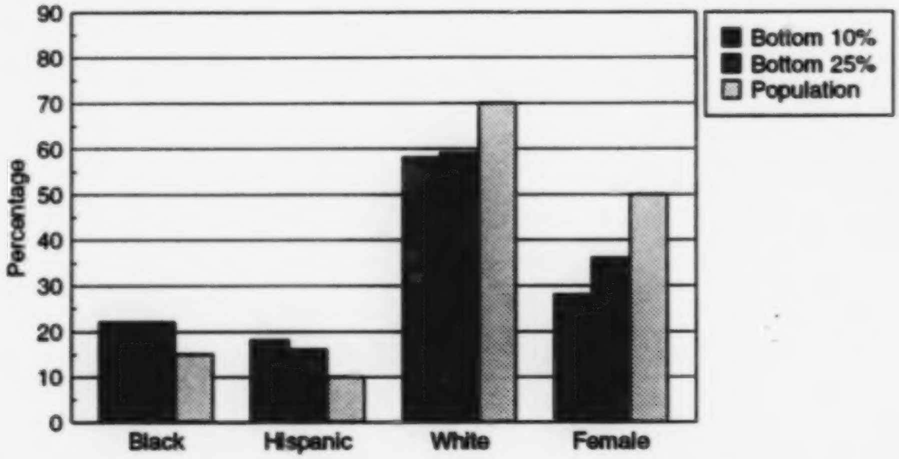


Figure 4.1--Percentage of Reading Achievement Groups in NAEP with Certain Demographic Characteristics

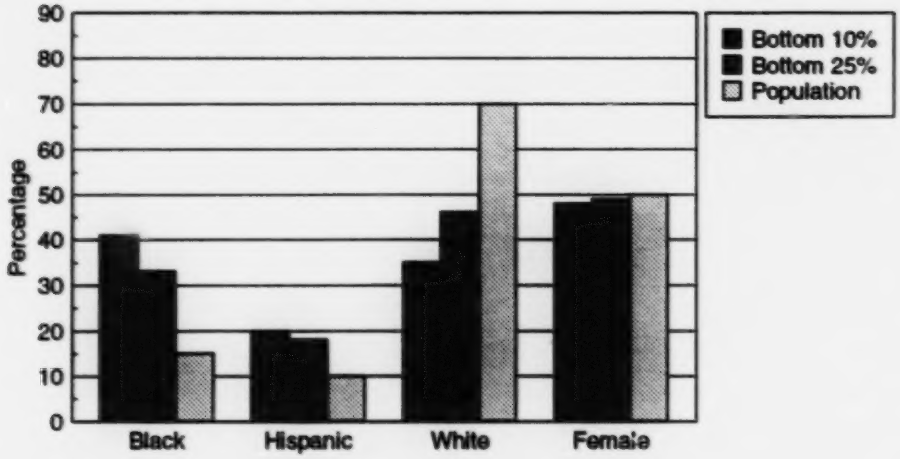


Figure 4.2-- Percentage of Mathematics Achievement Groups in NAEP with Certain Demographic Characteristics

Conversely, minorities are over-represented in the low-achieving groups. For instance, Table 4.1 shows that in reading 22 percent of the low-achieving group is black and about 17 percent is Hispanic compared to the NAEP reading population, which is 15 percent black and 10 percent Hispanic. These patterns are even more striking in mathematics (see Figure 4.2).

Females are under-represented among low achievers in reading but not in mathematics. Whereas the NAEP sample is 50 percent female, the low-achieving group in the bottom reading quartile is 36 percent female. Similar patterns for gender also appear in NELS (see Appendix A.2).

The comparisons between the bottom quartile and decile are strikingly similar. For most of the demographic characteristics, the differences between the bottom quartile and decile do not differ by more than a few percentage points. For example, whether considering the bottom quartile or decile, 22 percent of the low-achieving group is black, 16 - 18 percent is Hispanic, and 58 - 59 percent is white. Furthermore, Figure 4.2 shows that being female does not differentiate those who score in the bottom decile from those in either the bottom quartile or the entire population of eighth graders. There are a few exceptions, however, such as in NAEP mathematics, where 33 percent of students in the bottom quartile are black and 41 percent of those in the bottom decile are black. Another exception is that while gender does not differentiate between those in the bottom decile and quartile in most instances, it does in NAEP mathematics, where females comprise a smaller share of the bottom decile than of the bottom NAEP quartile (see Figure 4.1).

Family Characteristics

A variety of family characteristics differentiate students in the bottom quartile and decile from the population as a whole. Figure 4.3 depicts family characteristics that are currently in the NAEP (e.g., parents' education, single mother household, mother's labor force participation).

Insert Figure 4.3

Parents' educational attainment levels quite strongly differentiate students who are low achievers from the eighth-grade student population but do not strongly differentiate students scoring in the bottom decile from those scoring in the bottom quartile. In NELS, 58 percent of the students in the bottom quartile in mathematics have mothers who did not graduate from high school, compared to 43 percent in the population. Moreover, 43 percent of the students in the NELS population have fathers without a high school diploma compared to 61 percent of those scoring in the bottom mathematics quartile.

This same general pattern of overrepresentation in the low-achieving groups of students whose parents lack a high school diploma is apparent in NAEP, even though NAEP's measures of parental education (student reports) differ somewhat from the NELS measures (from parental reports) (see Appendix A.1 and A.2). NAEP reports a higher percentage of mothers without a high school diploma. Fifty percent of the

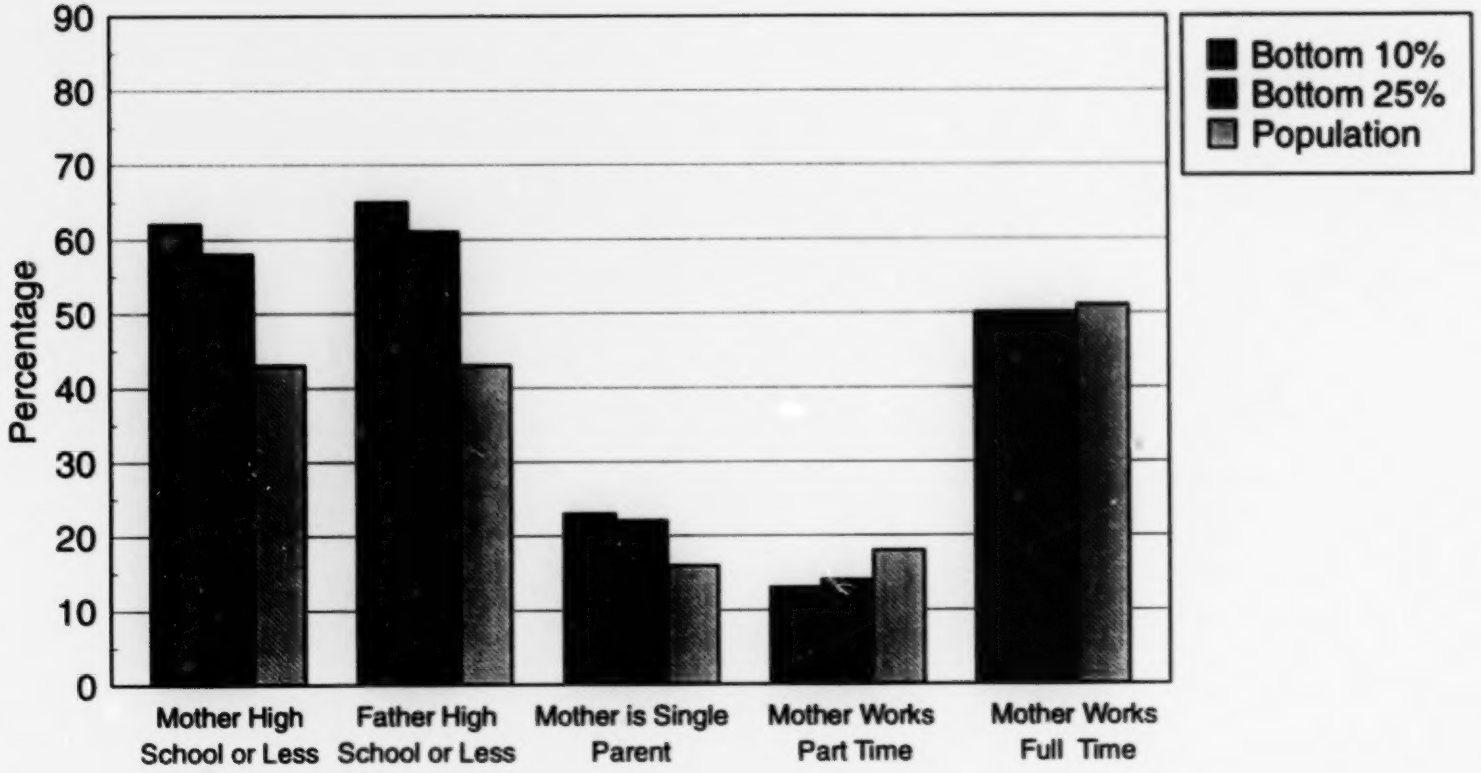


Figure 4.3– Percentage of Mathematics Achievement Groups in NELS with Certain Family Characteristics also Available in NAEP

students in the NAEP reading population report that their mothers are not high school graduates, but 43 percent of the students in NELS have mothers with less than a high school diploma.

Students in the low-achieving groups are also more likely than students in the population as a whole to be children of a single mother, but the differences are much smaller than those for parent education. The largest differences appear in mathematics (Figure 4.3). Sixteen percent of the students in the NELS population have mothers who are single parents; 22 percent of the low-achieving groups have such mothers.

The measures for mothers labor force participation – full or part time – do not strongly differentiate low-achieving students from the population, and the differences only appear in some of our comparisons. Students whose mothers work part time are slightly under-represented in the low-achieving groups on the NELS mathematics test compared to the population – 18 percent of the NELS population has mothers who work part time, but only about 14 percent of students in both the bottom mathematics quartile – but in NAEP, there is practically no difference between the low-achieving groups and the population in terms of mother's work status outside the home.

A number of family characteristics not presently in the NAEP differentiate students at risk of low achievement from the eighth-grade population. These include family income, family size, mother's age at birth of the child, and family closure. Income strongly differentiates the low-achieving groups from the population. Figure 4.4 shows that 37 percent of students who score in the bottom mathematics quartile are in families that earn less than $15,000 compared to 20 percent of the population that are in such families.[12] While 34 percent of the students in NELS have more than two siblings, over 40 percent of low those in the low achieving groups live in large families. Moreover, 13 percent of the NELS students have mothers who were twenty years old or younger when the eighth grader was born, but 20 percent of the students in the bottom mathematics quartile were born to young mothers. Finally, between 38 - 41 percent of students in the low-scoring groups are in families where the parent knows only two or fewer of the child's friends by name (i.e., low family closure), in contrast to twenty-six percent in the eighth grade population.

---

[12] The $15,000 cutoff that we use is the poverty rate for a family of six people in 1987 dollars. About 20 percent of the youth population in 1987 were living in poverty (see U.S. Bureau of the Census, 1989; U.S. Department of Education, 1993).

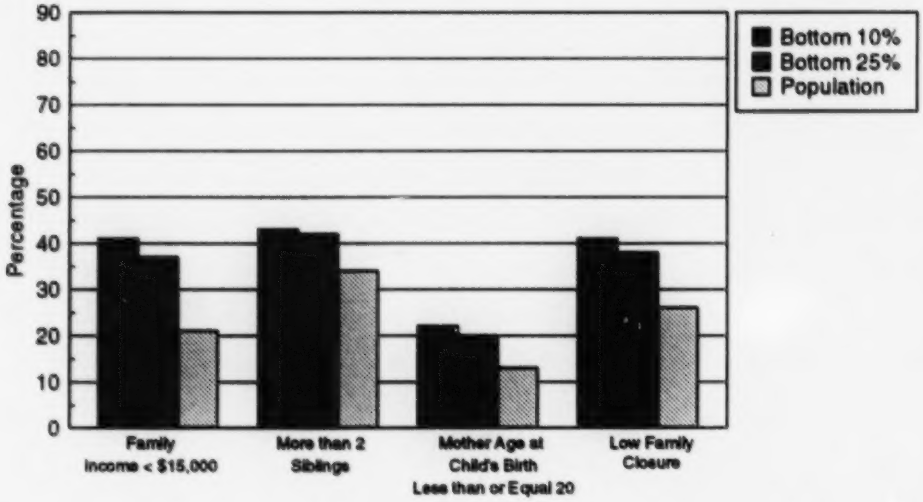


Figure 4.4-- Percentage of Mathematics Achievement Groups in NELS with Certain Family Characteristics Not in NAEP

Language Use and Immigrant Status Characteristics

NAEP and NELS measured language use differently. In NAEP, students were asked whether they used another language other than English; their responses were limited to "never," "sometimes," or "always." NELS asked several questions about language use, but we relied on the item that asked whether the students' usually spoke English, Spanish, or some other language other than English in their homes.

In NAEP, the language use measure does not differentiate low-achieving students from the population in reading but did slightly in mathematics. Figure 4.5 shows that 70 percent of the NAEP mathematics population never speaks a language other than English, whereas 66 percent of students in the bottom mathematics quartile and 63 percent in the bottom decile do so. The reverse pattern is seen among those who report "always" use a non-English language. While 7 percent of the population report always speaking a language other than English, 11 to 12 percent of low achievers report doing so.

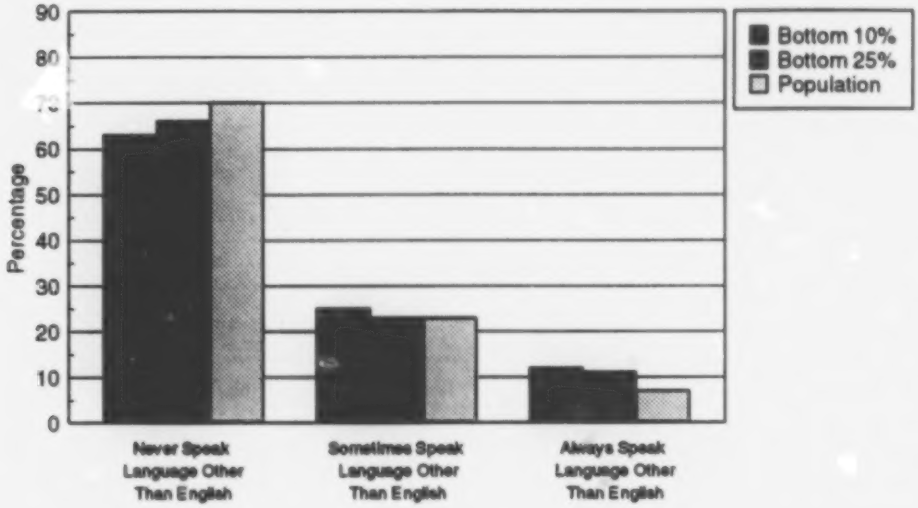


Figure 4.5--Percentage of Mathematics Achievement Groups in NAEP with Certain Language Characteristics

Similar to NAEP, the language-use measure in NELS differentiates low-achieving students, but the differences between groups are small. Figure 4.6 shows that 5 percent of the NELS population usually speaks Spanish at home, whereas about 10 percent of those scoring in the bottom reading quartile usually speak Spanish. A similar pattern appears for low-achieving groups on the NELS mathematics test.

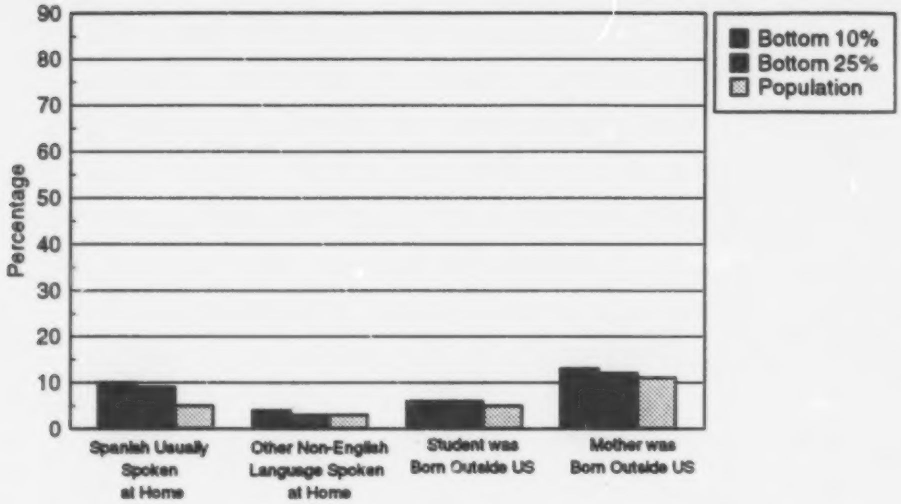


Figure 4.6– Percentage of Mathematics Achievement Groups in NELS with Certain Language and Immigration Status Characteristics

Immigrant status, whether of the eighth grader or of the eighth grader's mother, does not differentiate between low-achieving students and the general population. Five percent of the students in NELS were born outside the United States, and 11 percent of the eighth graders mothers were born in another country. Figure 4.6 shows that low-achieving groups in reading differ little from the population when considering the immigrant status measures. We found similar results in mathematics.

Academic Record

Eighth grader's academic records (e.g., school mobility, grade retention, grade point average, and homework) differentiate groups who score poorly on mathematics or reading from the population. Mobility and homework showed only moderate differences, while retention and GPA differentiated more strongly. Unfortunately, of these four variables, only self-reported homework is available in NAEP. Figure 4.7 shows that while 32 percent of the NELS population changed schools more than once since the first grade, 38 to 39 percent of students in the low-achieving groups changed schools.

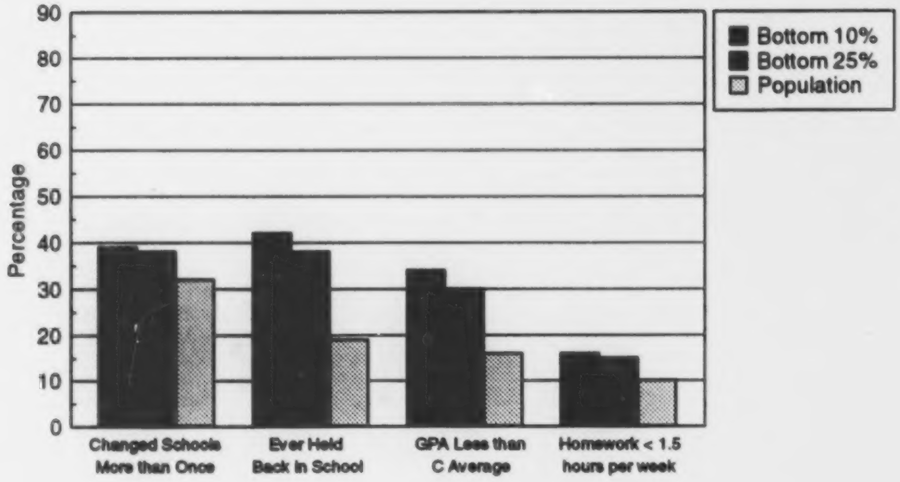


Figure 4.7--Percentage of Reading Achievement Groups in NELS with Academic Record Characteristics

The measure in NELS for grade retention substantially differentiates students at risk of low achievement from the population. For example, 42 percent of students scoring in the bottom reading decile and 38 percent in the bottom quartile were held back during their elementary schooling years, compared to 19 percent in the eighth-grade population. The differences between low-achieving mathematics students and the population are even more striking (see Appendix A.2).

Unsurprisingly, students' self-reports of their cumulative grade point averages across subjects since the sixth grade substantially differentiate low achievers from the population of eighth grade students. For instance, while 16 percent of the NELS students reported a C average or below, about 30 percent of those in the bottom reading quartile and about 35 percent in the bottom decile report a GPA of C or below.

The amount of homework per week the student reports distinguishes only modestly between low-achieving students and the population. For example, Figure 4.7

reveals that 10 percent of NELS students completed 1.5 hours or less of homework per week, whereas 15 percent of those scoring in the bottom reading quartile and about 16 percent of those in the bottom decile completed this amount. A homework measure was also available in NAEP, and the patterns are even more striking than those in NELS, especially on the NAEP reading test (see Appendix A.1).

School Characteristics

Several school characteristics available in the NAEP are useful for distinguishing low-achieving students from the eighth-grade population as a whole. Some of these are aggregate values of individual characteristics noted above (e.g., parent education and homework). Low-achieving students are disproportionately in schools characterized as having a significant percentage of students who receive free lunch, who are minority, who have parents with low education levels, and who complete small amounts of homework. Low-achieving students are under-represented in private schools.[13]

Figure 4.8 provides an illustration of the school characteristics in NAEP that differentiate students at risk of low achievement from the eighth-grade population. While 11 percent of student in the NAEP population attend private schools, 5 percent of those scoring in the bottom quartile and 4 percent in the bottom decile are in private schools. Students in schools where more than 50 percent of the student body receives free or reduced lunch or who attend schools that are more than 25 percent minority are also over-represented in the bottom quartile and decile.[14] (Although free lunch is often used as a proxy for school poverty, comparisons with school income levels (and analyses in Chapter 5) reveal that these variables do not identify the same groups of students.)

---

[13] For these analyses, both Catholic and other private schools were considered private.

[14] The threshold of more than 50 percent of the students receiving free or reduced lunch is based on recent federal legislation -- The Improving America's Schools Act of 1994 -- that enables Title I schools to develop school-wide programs if half of its students are poor. Previously, 75 percent of a school's student population had to be poor to develop school-wide programs with Title I funds.

Insert Figure 4.8

The average parent education of students in the school also differentiates between low achievers and the NAEP population. In mathematics, 33 percent of the students in the NAEP are in schools where the average parent education level is thirteen years or less (i.e., one year beyond high school graduation), but 49 percent of low achievers are in such schools.

Finally, the average level of homework assigned by the school differentiates students who score poorly on academic achievement tests from the general population. For example, 20 percent of the NAEP population, compared to about one-fourth of the students in the bottom quartile and decile, attend schools where the average amount of homework assigned in the school is less than 5 hours per week.

There are some exceptions to these patterns when considering reading in NAEP and the NELS tests. In both NAEP and NELS school measures for free lunch, minority composition, and parent education more strongly differentiate low-achieving groups from the population in mathematics than reading. Moreover, these measures within NAEP also distinguish the bottom decile from the bottom quartile in mathematics, but not in reading (see Appendix A.1 and A.2).

Two measures of school characteristics available in NELS that are absent in the NAEP -- school mean income and school closure -- strongly differentiate between low achievers and the population as a whole. Students in the low-achieving groups are over-represented in schools that have low mean incomes and have low levels of school closure (e.g., connections among families). Figure 4.9 shows that 36 percent of students scoring in the bottom quartile and 39 percent of those in the bottom decile attend schools where the average family income level is less than $25,000, compared to 20

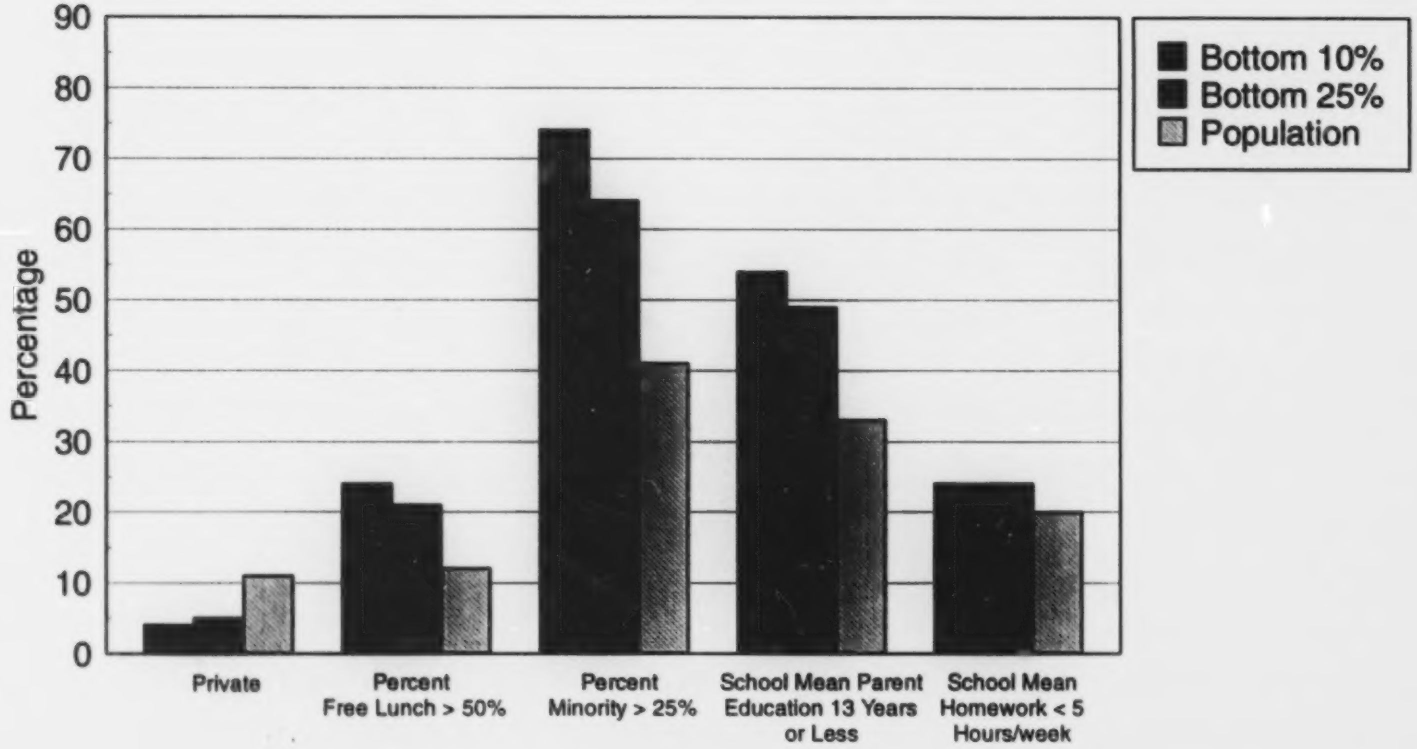


Figure 4.8--Percentage of Mathematics Achievement Groups in NAEP with Certain School Characteristics

percent of the NELS population in such schools.[15] In addition, while one in five students in the population attend schools that have low levels of school closure, about one-third of the low-scoring students are in schools with low levels of closure.

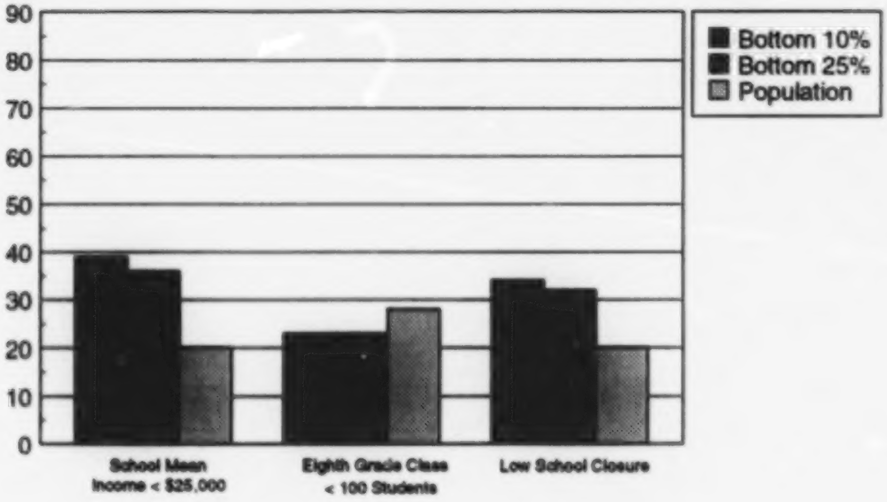


Figure 4.9–Percentage of Mathematics Achievement Groups in NELS with School Characteristics Not in NAEP

Community Characteristics

Very few of the community measures we analyzed provided consistent contrasts between students at risk of low achievement and the general population. Because NAEP and NELS yield inconsistent findings for urban locale, relying on the urbanicity measure to report comparisons between low achievers and the population is ill-advised. The NAEP size and type of community measure differentiates groups, but the validity of STOC has been criticized, so using it to report comparisons is questionable. Some interesting contrasts comparisons appear for region (e.g., low achievers are over-represented in the South), but generally high quality measures of community and neighborhood characteristics are lacking in both NAEP and NELS.

---

[15] The school income cutoff of $25,000 is 70% of the school median income. Even though this is an arbitrary threshold, about 20% of the sample reports being in such schools which is similar to the percentage of the 1987 youth population living in households below the poverty line (U.S. Census Bureau, 1989; U.S. Department of Education, 1993).

In sum, our univariate comparisons between low-achieving groups and the eighth grade population suggest that while NAEP presently contains several demographic, family, and school measures useful for this purpose, but it could be substantially improved by including additional measures like those found in NELS.

5. ASSESSING NAEP'S ADEQUACY FOR PREDICTING LOW ACHIEVEMENT

The univariate analyses above showed that when examined individually, a wide array of social context measures – some available in the NAEP, some not – differentiate students with low test scores from the population. However, many of these social context measures are strongly related to each other, so their univariate relationships with low achievement can be quite different from their independent effects on achievement when other aspects of social context are held constant.

Therefore, this chapter examines the independent effects of social context measures on the probability that a student will score in the bottom quartile or decile, after other social context measures are taken into account. Specifically, it addresses several questions: First, what social context measures are independently related to low achievement apart from their relationships with other factors? For example, are students from poor families more likely to score in the bottom quartile than non-poor students after accounting for other differences in social context? Second, which measures presently in the NAEP have the most important independent relationships with the probability of having low achievement scores? Third, what measures should be added to the NAEP to make it more useful in this regard? Finally, to what extent can measures currently in the NAEP serve as proxies for those that are omitted?

APPROACH

Logistic regression was used to assess the independent relationships between social context measures and the probability of scoring in the bottom quartile or decile in reading or mathematics. (Logistic regression was used because ordinary least squares regression can yield biased estimates when an outcome variable is dichotomous and the probability of being in one of the categories is small.) Logistic regression estimates the probability that students with specified combination of social context characteristics will score poorly. By definition, the overall (unadjusted) probability of scoring in the bottom quartile is .25; the estimated probability for students with any given combination of social context characteristics could in theory range from 0 (no such students are in the bottom quartile) to 1 (all of them are). If the values for other social context measures are set to the grand mean, these models estimate the probability that a student who has a given characteristic but is in other respects average would score in the bottom quartile or decile. For example, a student with a household income of $15,000 has a probability of .34 of scoring in the bottom quartile, as compared to a probability of .25 for the population as a whole. However, if a large enough number of other social context variables (for example, parental education) are held constant at the grand mean, students with a household income of $15,000 are a bit less likely than average (probability = .21) to score in the bottom quartile.

A word of caution is needed about interpreting the "independent effects" estimated in these models. Many of the social context measures analyzed here are substantially collinear (i.e., related to each other). Impoverished parents are more likely than others to be poorly educated, for example. If enough collinear variables are entered into a model, the independent "effects" of many of them will appear small. For instance, in the example given above, when enough other social context variables are taken into account, moderately low income no longer predicts a higher-than-average probability of low achievement. In that same model, the mother having less than a high school education also shows no independent association -- holding other variables constant -- with the probability of low achievement. This finding does *not* mean that neither income nor parental education "really" affects student achievement. These models do not show which of the collinear variables actually *causes* differences in achievement, and either maternal education, income, or both could in fact be powerful influences on student achievement. The model simply says that once one has taken a large enough number of these related variables into account, information about one additional measure does not add further to one's ability to predict low achievement.

The models reported here include individual-level variables (student and family characteristics), school characteristics, and community characteristics. Some of the school characteristics are aggregate values of individual variables (i.e., parent education, homework, income, and closure); the other school measures are based on school reports. All of the analyses reported here use NELS, although some of them (the "NAEP-like" models) are restricted to variables included in NAEP. This allows us to examine both the importance of variables in NAEP and the impact of NAEP's omission of some variables without confounding these issues with other, irrelevant differences between the databases. Since the logistic regression results are similar in mathematics and reading and in the bottom quartile and decile, only the results for the bottom quartile in mathematics are presented here.

The analysis involved several steps. First, to examine the independent associations between low test scores and social context measures, we present three sets of probabilities. We first present the *unadjusted* probability of scoring poorly for each social context measure by itself -- for example, the probability that a student who comes from a poor family would score in the bottom quartile without accounting for any other differences in social context. (These are the probabilities discussed in the previous chapter.) We also show the adjusted probabilities of scoring in the bottom mathematics quartile that control for a number of other social context measures available in NAEP. We refer to this specification as the *NAEP-like model*. In addition, we present probabilities that adjust for a larger set of social context measures, some of which are not currently in the NAEP (e.g., the *full NELS model*, which includes a substantial number of variables available in NELS but not NAEP). These three sets of probabilities allow us to assess what variables presently in the NAEP are most important for predicting low mathematics scores and what important variables are missing from NAEP.

Second, to further assess whether specific measures would improve the NAEP's adequacy to predict low achievement, we add measures not currently in the NAEP one at a time to the NAEP-like model. For example, we add family income to examine whether income has a significant effect on the probability of low achievement over and above those variables already in the model and available in NAEP. This helps determine the extent to which variables included in NAEP serve as proxies for those that are omitted. For example, if income adds little to the prediction that a student will score in the bottom quartile, it can be argued that the variables included in NAEP are a sufficient proxy for income *for that particular purpose*.

Third, a number of social context variables were regressed on other such variables; for example, regression was used to estimate the extent to which family income is predicted by the other social context variables in NAEP. These regressions help clarify both the problem of collinearity and the utility of NAEP's variables as proxies for other, omitted variables. Bivariate correlations were also examined to further investigate the issue of proxy measures (see Appendix B).

SUMMARY OF RESULTS

As expected, both of our models (the NAEP-like model and the full NELS model) showed that when one holds constant a large number of social context variables, numerous variables that showed strong univariate relationships with low achievement do not show a large independent association with low achievement. For instance, measures for single parent households, school minority composition, and percentage in the school on free lunch differentiated low-achieving groups from the population in the previous chapter, but they were not independently associated with low achievement scores in the analyses that follow. While some of these measures remain statistically significant in our multivariate models, the effects are trivial. For example, students in primarily black schools are barely more likely to score poorly than students in primarily white schools once a variety of other variables (including the students' own population group) are taken into account. This contrasts the univariate descriptions of the last chapter that show sharp differences between the percentage of low achievers and the population who attend more racially and ethnically diverse schools. Furthermore, language use, mother's labor force participation, school sector, and urban locale, which do not strongly differentiate low achieving groups from the population (see the previous chapter) are also not related to low test scores when controlling for other factors.

However, several demographic, family, and school characteristics presently in the NAEP continue to be related to low achievement scores, even after holding constant a large number of other social context variables. The demographic and family characteristics that have the strongest independent association with low achievement are population group membership and parents' educational attainment, which show substantial relationships even after other family, school, and community differences have been taken into account. Black students are much more likely to score poorly than Hispanics and especially whites from similar social contexts. In addition, while students whose mothers or fathers only graduated high school have probabilities of low achievement almost equal to the population, eighth graders who have college-educated parents are much less likely to score in the bottom mathematics quartile even after other factors have been taken into account.

School characteristics measured in NAEP also show substantial independent associations with the probability of being a low-achiever even after taking other individual and school characteristics into account. There are striking differences between students in schools that have highly educated parents and those that do not. Students in schools where the average level of parent educational attainment is less than high school graduation have about a fifty percent chance of low mathematics achievement ($p = .50$). Students in schools with highly educated parents have about a one in ten chance of scoring poorly ($p = .10$). In addition, students in schools with greater amounts of homework assigned are less likely to score in the bottom quartile.

Some of the social context variables that are included in NELS but not NAEP have substantial independent relationships with the probability of being a low achiever. The most important characteristics absent from the NAEP include measures for grade retention and immigration status. The adjusted probability of scoring in the bottom mathematics quartile is .42 for students who report being held back prior to eighth grade -- seventeen points above the population probability. Immigration status, both of the student and the eighth grader's mother, are strongly related to test scores, but in the opposite direction of what is often assumed. Controlling for other differences in social context, students who are immigrants (or whose mothers were born outside the U.S.) are much less likely to score in the bottom mathematics quartile. The adjusted probability of low achievement for immigration status is .15.

In addition, although the NAEP-like and full NELS models are similar in many respects, some of the estimated relationships differ in important ways. This may mean that the omission of some social context variables in NAEP leads to biased estimates of their effects. For example, when estimating the independent association between school mean parent education and low test scores, the model that adjusts only for variables in NAEP estimates a higher probability of low achievement, especially for students attending schools where parents are less educated, because it does not separate the effects of certain social context variables that are related to parental education.

On the other hand, a number of other characteristics not measured in the NAEP either are not statistically related to low scores or have only weak relationships to it.

These include family income; family size; mother's age at birth of the eighth grader; family closure; school mobility; and school income, closure, and size. For instance, there is a only very weak relationship between scoring poorly in mathematics and family income after other differences in social context have been taken into account.

These findings raise the question: how adequate are the social context variables in NAEP as proxies for measures of income that NAEP lacks? The answer depends on the purpose to which the variables are put. If the goal is only to predict the probability that a student will be a low achiever, these results suggest that a large enough number of the NAEP social context variables, taken together, are a fairly good proxy for income. That is, adding an income variable to the them will not dramatically change the predicted probability of scoring in the bottom quartile.

However, further analyses show that for other purposes -- for example, to monitor the achievement of poor students -- the variables included in the NAEP do not provide an adequate proxy for income. For example, regressing the family income measure on the other social context characteristics available in NAEP yields an adjusted R^2 of .31. That is, the other social context variables predict only about a third of the variance in income. Because family income has a strong unadjusted relationship with low test scores and a weak relationship once other factors are controlled, we conclude that the portion of family income that matters in predicting the probability of low achievement is the third of the variance in income that is related to the other social context variables in our full NELS model.

The sections that follow provide further detail about our analyses. First, we present three sets of probabilities, one set for the unadjusted and two sets for those that adjust with variables available in NAEP and those that control for a wider set of measures. Second, we present the results that show what the net impact would be of adding particular social context measures one at a time to those already in NAEP. Third, we further explore the issue of adequate proxies in NAEP by showing the relationships among the social context measures based on ordinary regressions.

PREDICTING LOW TEST SCORES WITH SOCIAL CONTEXT MEASURES

Table 5.1 shows three sets of estimated probabilities. The first column of numbers reveals the unadjusted probabilities that do not control for any other social context measures. The second column lists the probabilities that adjust for demographic, family, and community measures that are in NAEP, but based on NELS data. The probabilities in the third column take into account an even wider set of social context measures beyond those available in NAEP. The shaded areas of the table highlight those additional variables available in NELS but not in NAEP that were included when estimating the probabilities in the third column (*na* indicates "not available" in NAEP).

The adjusted probabilities were calculated (from the logistic regression models) by setting other social context measures to the grand mean except for the variable of interest, so these models estimate the probability that a student with a certain characteristic, but otherwise "average," would score in the bottom mathematics quartile. While the interpretation of the variables that were dummy coded (e.g., population group, parental education, etc.) is straightforward, the interpretation of estimates for continuous variables is less so. In Table 5.1, the continuous variables have been set to specific values that are noted in the first column; for example, annual income was set to $15,000 (the poverty level for a family of six in 1987 dollars), and the values in the three columns to the right are the unadjusted and adjusted probabilities that students with a family income of $15,000 would score in the bottom quartile. A more informative approach, presented later, estimates the adjusted probabilities of low achievement for a broad range of values on the continuous variables.

Before getting to the specific results, it is important to note several general patterns in Table 5.1. First, many of the relationships between particular social context measures and low test scores, while strong in the univariate comparisons, are substantially reduced in the multivariate analyses. Of course, as we previously pointed out, the weaker relationships are expected when adjusted for such a large number of other factors, and we need to be careful in the interpretation of the probabilities based on such adjustments.

Second, the table shows that those probabilities that adjust for only those variables in NAEP and those that adjust for even more measures are strikingly similar. While we will note some exceptions in the next section, this similarity between the models suggests that for the specific purpose of predicting the probability of low achievement, those variables presently in NAEP, taken together, serve as a reasonably adequate proxy for those that are missing.

Third, consistent with what has been found in the literature on risk, students who experience only one risk factor are not necessarily likely to be low achievers (see Rutter, 1990; Rolf et al., 1990; Werner and Smith, 1992; Masten, 1994; Grissmer et al., 1995). For instance, students are not more likely to be low achievers when compared to the population if they are "average" except for one of the following characteristics: have parents with low educational attainment levels, live in poverty, have a mother who is a single parent, are in large families, have parents who don't know their child's friends, are primarily Spanish speakers, or in minority schools or low socioeconomic status schools. Table 5.1 shows that single measures associated with greater adjusted probabilities of low achievement include being black or being held back in school.

Table 5.1

Unadjusted and Adjusted Probabilities of Scoring in the Bottom Mathematics Quartile in NELS.

	Unadjusted Probabilities	Adjusted Probabilities Variables in NAEP	Adjusted Probabilities Full NELS Model
Population Group Characteristics			
Black	0.52*	0.37*	0.34
Hispanic	0.39*	0.24*	0.23
White	0.18*	0.18*	0.17
Family Characteristics			
Mother's Education High School or Less	0.46*	0.28*	0.24*
Mother's Education High School Graduate	0.27*	0.23*	0.22*
Mother's Education Some College	0.22*	0.21*	0.20*
Mother's Education College Graduate	0.09*	0.13*	0.14*
Father's Education High School or Less	0.30*	0.29*	0.25*
Father's Education High School Graduate	0.45*	0.24*	0.22*
Father's Education Some College	0.22*	0.20*	0.19*
Father's Education College Graduate	0.10*	0.14*	0.15*
Mother Is Single Parent	0.33*	0.21	0.18
Mother Works Full Time	0.24*	0.21*	0.20
Mother Works Part Time	0.19*	0.20*	0.19
Family Income = $15K	0.34*	*na*	0.21*
Number of Siblings = 3	0.42*	*na*	0.20
Mother's Age at Child's Birth =20	0.27*	*na*	0.20
High Family Closure (=5)	0.15*	*na*	0.18*
Language Use Characteristics			
Spanish Usually Spoken at Home	0.44*	0.22	0.23
Language Other than English Usually Spoken at Home	0.25	0.22	0.23
Immigration Status Characteristics			
Student Was Born Outside U.S.	0.26	*na*	0.15*
Mother Was Born Outside U.S.	0.27*	*na*	0.15*
Academic Record			
Changed Schools More than Once	0.30*	*na*	0.20
Ever Held Back	0.52*	*na*	0.42*
Homework = 10 Hours/Week	0.18*	0.18*	0.17*

BEST COPY AVAILABLE

Table 5.1 (continued)

Unadjusted and Adjusted Probabilities of Scoring in the Bottom Mathematics Quartile in NELS.

	Unadjusted Probabilities	Adjusted Probabilities Variables in NAEP	Adjusted Probabilities Full NELS Model
School Characteristics			
Catholic School	0.17*	0.22	0.24
Other Private School	0.24*	0.19	0.20
School Percent Free Lunch = 50%	0.36*	0.22	0.20
School Percent Black = 25%	0.29*	0.22*	0.20*
School Percent Hispanic = 25%	0.29*	0.20*	0.20
School Mean Parent Education = 14	0.20*	0.19*	0.18*
School Mean Homework = 10 hours/week	0.12*	0.18*	0.16*
School Mean Income = $15K	0.45*	*na*	0.20
Eighth Grade Class Size = 100	0.23*	*na*	0.20
School Mean Closure = 5	0.11*	*na*	0.17*
Community Characteristics			
Urban	0.32*	0.23	0.20
Rural	0.25*	0.20	0.19
Suburban	0.21*	0.21	0.20
Northeast	0.21*	0.20	0.19
North Central	0.20*	0.19	0.19
West	0.25*	0.24*	0.23*
South	0.31*	0.21*	0.19*

Notes: An asterisk (*) indicates probability is significant at the .01 p-level. Unadjusted here refers to those probabilities that do not control for any other social context measures, while adjusted probabilities control for other factors by assigning other variables to the grand mean. Variables not presently available in the NAEP are shaded, marked with *na* and used only to adjust the probabilities in the second column.

BEST COPY AVAILABLE

Population Group Characteristics

Even after controlling for a wide variety of individual, school, and community characteristics, black students have a higher probability of scoring in the bottom quartile, but the black-white difference is greatly reduced. The first panel of Table 5.1 shows that without adjusting for other factors, a black student has about a fifty percent chance of scoring in the bottom quartile in mathematics (p = .52). If a black student is from an otherwise "average" family, school, and community, however, the probability of low achievement is reduced to about one in three. White students have a probability of low achievement between .17 and .18, depending on what other social context measures are taken into account. Hispanics present a somewhat different picture: controlling for wide array of social context variables reduces their probability of being in the bottom quartile from quite high (p = .39) to about average (p = .24), although that still leaves them somewhat more likely than whites to be low achievers.

Family Characteristics

Parental education shows a relationship with the probability of low achievement even after controlling for other social context variables, but the relationship is greatly reduced from the unadjusted, univariate differences. Controlling for other social context variables largely eliminates the higher-than-average probability that children of poorly educated parents will score in the bottom quartile, and it somewhat increases the probability that the children of college-educated parents will score in that range. Nonetheless, even after controlling for a wide variety of variables in the full NELS model, the probability that the child of a college-educated parent will score in the bottom quartile is 10 percentage points less than the probability for a child of a parent with less than a high school education.

Several family variables are weakly related to low test scores in Table 5.1, including single mother households, mother's labor force participation, family income, family size, and age of mother at child's birth. Only the first two measures are presently in the NAEP. The strong univariate relationship between low income and low mathematics scores is substantially diminished when controlling for other demographic, family, school, and community characteristics. The unadjusted probability that a student who lives in a poor family (e.g., $15,000) is .34, but controlling for other differences reduces the probability to .21. Similarly, the unadjusted probability of students in larger families (p = .42) is reduced in the full NELS model.

Students who live in families with greater amounts of closure – i.e., parents know their child's friends -- are less likely to be low achievers, even after controlling for other social context variables. Such students have a probability of low achievement of .18.

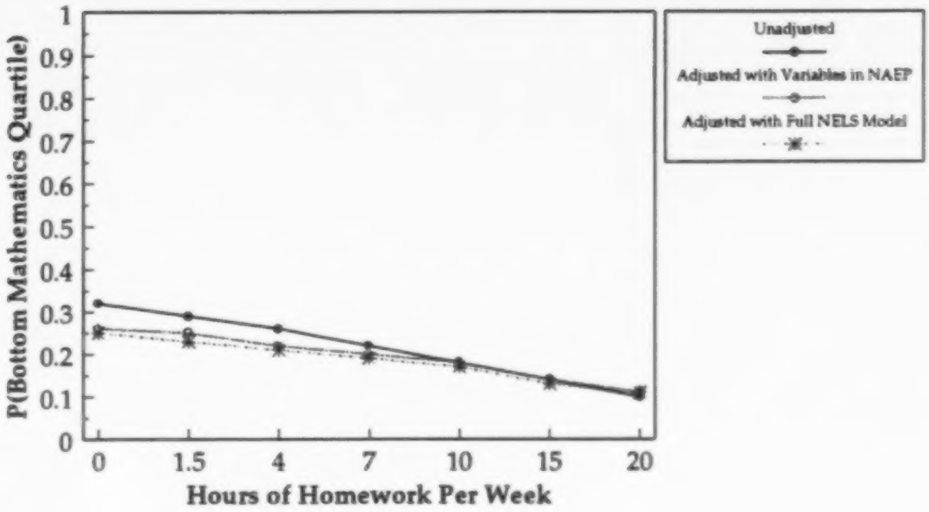
Language Use, Immigration Status, and Academic Characteristics

Immigration status, grade retention, and homework are other individual characteristics that show independent relationships to the probability of scoring in the bottom quartile. Of these three measures, only homework is presently available in NAEP. Students who were born outside the U.S. or who had mothers who were immigrants are much *less* likely to score in the bottom quartile, after one controls for other social context differences between immigrants and others. Both immigrants and children of immigrant mothers have an adjusted probability of .15 of scoring in the bottom quartile. These findings sharply contrast the univariate descriptions that did not show immigration status differentiating low-achieving students from the population. Being held back in school at some point up to the eighth grade is strongly related to low test scores. Even after controlling for a variety of other social context characteristics, the probability of low mathematics achievement is .42.

Students who report doing relatively little homework are also more likely to score in the bottom quartile, and adjusting for other social context measures reduces but does not eliminate this pattern. To illustrate, Figure 5.1 plots the unadjusted and adjusted probabilities for low achievement for students who report different levels of homework. Controlling for other social context variables lessens the probability that students who do very little homework will score in the bottom quartile – bringing that probability down to near the population level of .25. Nonetheless, the pattern that students doing more homework are less likely to score in the bottom quartile remains substantial, albeit weaker than in the case of unadjusted probabilities. Moreover, the NAEP model and the full NELS produced nearly identical results.

Figure 5.1

Probability of Low Mathematics Achievement in NELS by Hours of Homework Per Week



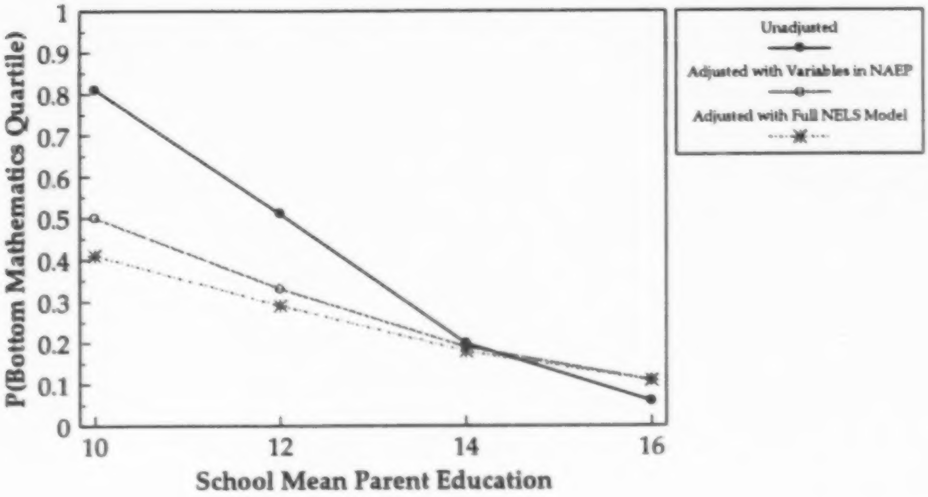
Other characteristics such as language use and school mobility do not appear to have strong independent relationships with low mathematics achievement (see Table 5.1). While students who report speaking Spanish in their homes have an unadjusted probability of low achievement of .44, they have an average probability once other factors have been controlled. Moreover, changing schools does not place students at risk of low achievement if other social context measures are taken into account.

School and Community Characteristics

Students who attend schools with higher mean parent education levels are less likely to be low achievers. This is shown in Table 5.1 but is more apparent when a wider range of values of parental education and homework are considered (Figures 5.2). The unadjusted relationship between parental education and the probability of scoring in the bottom quartile is very strong (Figure 5.2). Controlling for a wide variety of individual- and school-level social context variables reduces the relationship markedly but still leaves s sizable relationship (Figure 5.2). For example, using the NAEP-like model, the probability that students will score in the bottom quartile is about .5 in schools in which the mean parental educational is only 10 years; the corresponding probability for schools in which the average level of parent education is a college degree is .11. In this case, the full NELS model reduces the relationship somewhat more than the restricted, NAEP-like model.

Figure 5.2

Probability of Low Mathematics Achievement in NELS
by School Mean Parent Education

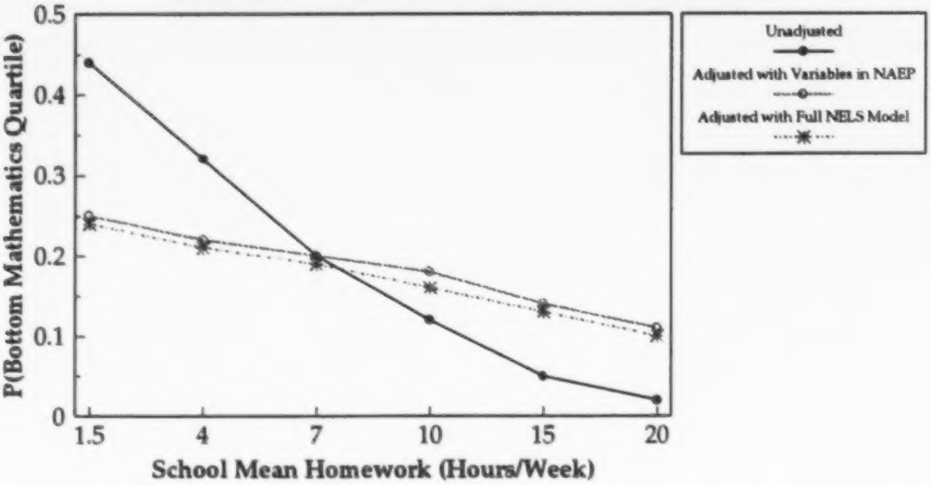


Students in schools that assign greater amounts of homework are also less likely to be low achievers (see Figure 5.3). Here again, the very strong unadjusted relationship is greatly reduced but remains appreciable after controlling for other student and school characteristics. In this instance, the additional variables absent from NAEP but included in the full NELS model have no practical impact. These patterns stand in contrast to the finding that the amount of homework reported by individual students bears little independent relationship to the probability of being a low-achiever.

BEST COPY AVAILABLE

Figure 5.3

Probability of Low Mathematics Achievement in NELS
by School Mean Hours of Homework Per Week

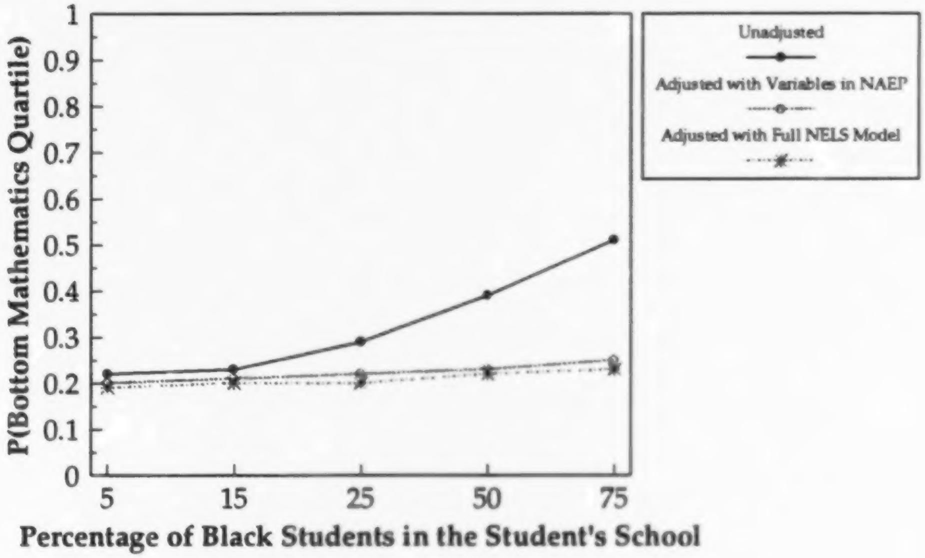


In contrast, the relationship between the racial/ethnic composition of schools and the probability of being a low achiever, very striking in terms of unadjusted probabilities, essentially evaporates when a wide variety of social context variables are taken into account (see Figure 5.4). This is true of both the restricted NAEP-like model and the more inclusive full NELS model. It is important to note that among the variables held constant in both of these models is the racial/ethnic identity of individual students.

Other variables that do not have a substantial independent relationship with the probability of scoring in the bottom quartile are school sector, the percent of student on free or reduced lunch, the size of the eighth grade class in the school, urban locale, and region.

Figure 5.4

Probability of Low Mathematics Achievement in NELS
by School Percentage Black



NET EFFECTS OF MEASURES ADDED TO THE NAEP-LIKE MODEL

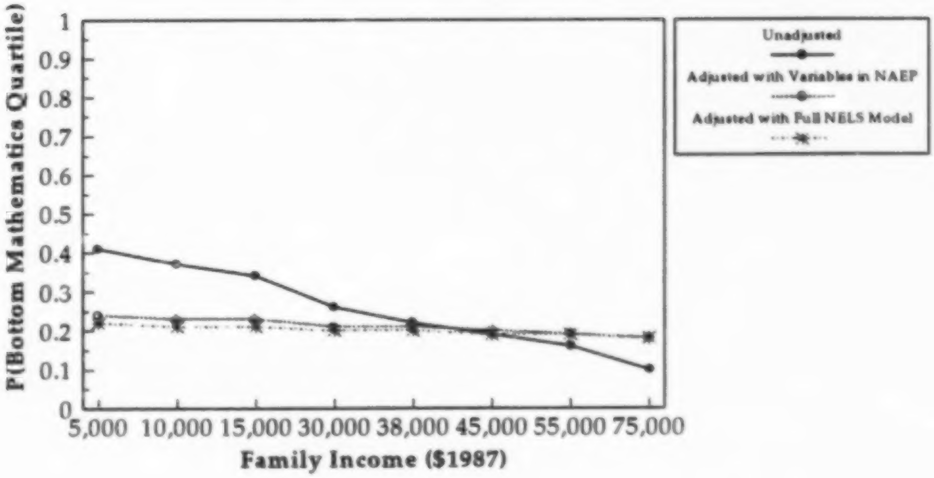
Even though the NAEP-like and full NELS models provided similar adjustments to the probabilities of low mathematics scores, an important question remains -- what would NAEP gain if it added specific measures such as family income? This cannot be ascertained solely by comparing the NAEP and NELS models, because the latter adds a variety of additional variables, which could obscure the impact of any one of them.

For the specific purpose of predicting the probability of low achievement, adding measures for family income, school income, mother's age at birth of the eighth grader, school mobility, family size and grade size -- one variable at a time --does not substantially improve the prediction of low achievement scores.

For example, Figure 5.5 shows the probability of low mathematics achievement for students with household incomes ranging from $5,000 to $75,000 (in 1987 dollars). The unadjusted probabilities show what one would expect: the probability of falling into the bottom quartile in mathematics falls steadily as family income rises. In contrast, when other social context variables are taken into account (using either the NAEP model with income added or the full NELS model), income shows little independent relationship with the probability of being in the bottom quartile. The lines for those estimates are nearly flat.

Figure 5.5

Probability of Low Mathematics Achievement in NELS by Family Income

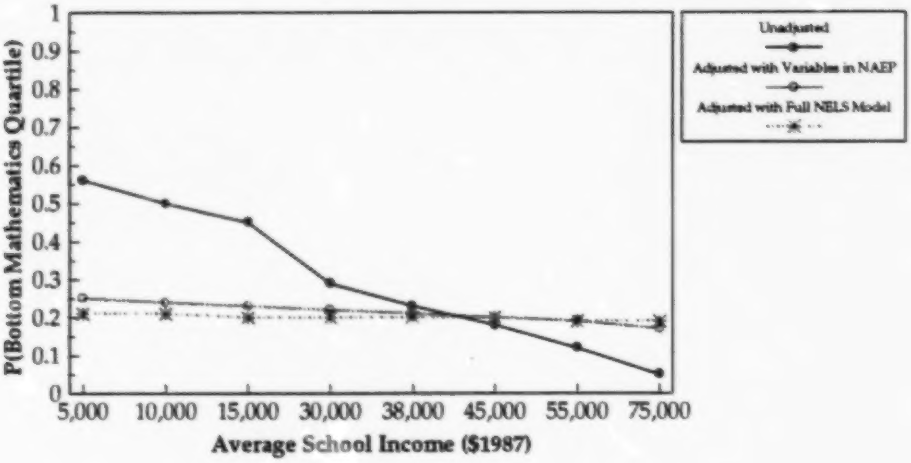


Similar patterns emerge for the aggregated measure of school income in Figure 5.6. Once other variables in NAEP are taken into account the differences in the probability of low achievement are very small whether the student attends a poor or rich school.

BEST COPY AVAILABLE

Figure 5.6

Probability of Low Mathematics Achievement in NELS
by School Income

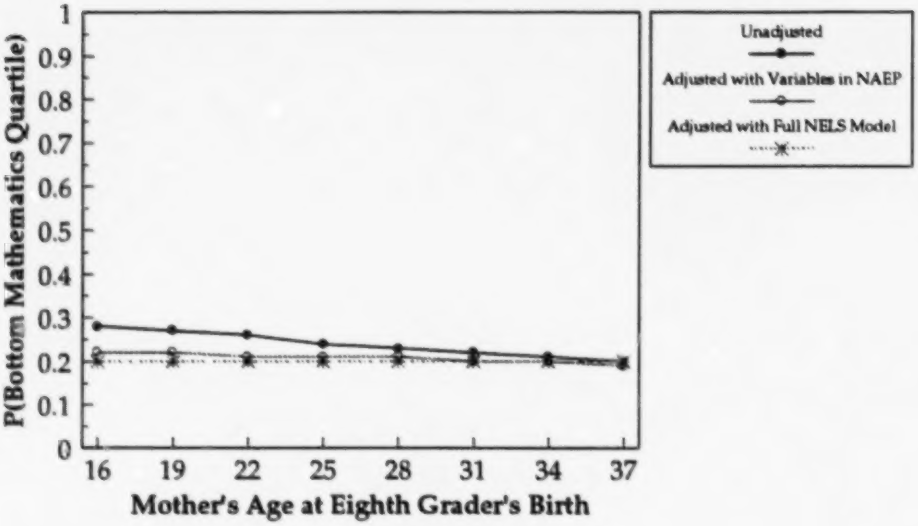


Mother's age at birth of the eighth grader is only weakly associated with the probability of scoring in the bottom quartile even in terms of unadjusted probabilities (Figure 5.7). The weakness of this relationship may reflect a poor choice of measures; a stronger relationship might have been found had NELS asked the mother's age at time of first birth. But when this variable is added to the NAEP model, it has no appreciable independent relationship with the probability of scoring in the bottom quartile.

BEST COPY AVAILABLE

Figure 5.7

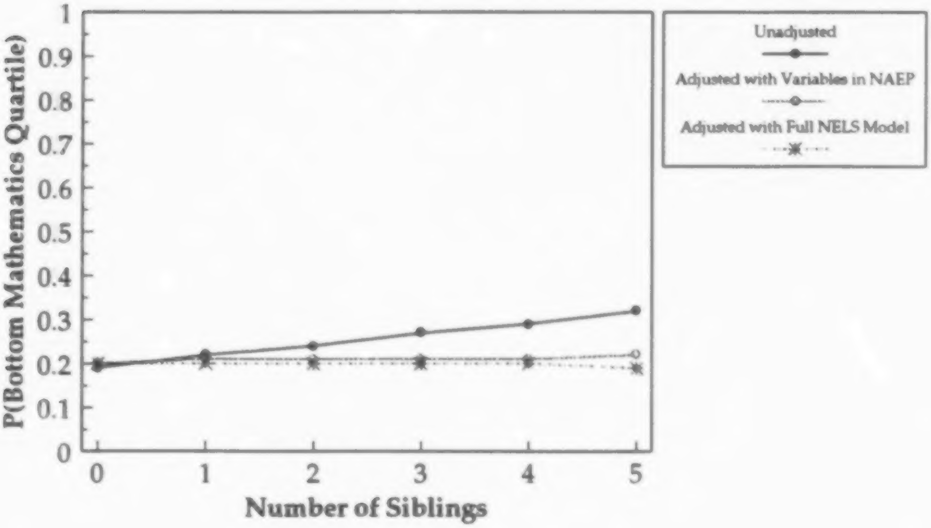
Probability of Low Mathematics Achievement in NELS by Mother's Age at Birth of Eighth Grader



Furthermore, measures for family size, eighth grade class size, and school mobility, when added one at a time to the NAEP model, do not show appreciable independent relationships to low achievement and do not substantially affect the prediction of scoring in the bottom quartile. This is illustrated by the weak adjusted relationship between number of siblings (e.g., family size) and low achievement scores (Figure 5.8).

Figure 5.8

Probability of Low Mathematics Achievement in NELS
by Number of Siblings



ASSESSING RELATIONSHIPS AMONG THE SOCIAL CONTEXT MEASURES: THE ISSUE OF PROXY MEASURES

The issue of whether extant measures in NAEP serve as adequate proxies for omitted social context variables depends on the purpose of the NAEP. If the main question is whether the prediction of low achievement in NAEP is affected by the omission of some particular social context measure, then the results in the previous section show that the answer is no. The adjusted probabilities in the NAEP-like and full NELS models are strikingly similar and adding social context measures that are not presently in NAEP reveal only weak relationships with low scores (or no relation at all).

However, if the question is whether the existing social context measures allow researchers and policymakers to identify the same low-achieving students, then measures in NAEP must explain a substantial portion of the variable that is omitted. To assess the adequacy of the NAEP in this regard, the relationships *among* the social context measures are examined. Table 5.2 shows the results from several ordinary regressions in NELS that relate selected family measures to the other demographic and family measures and to a wider set of social context measures (e.g., adding school and community characteristics). All of these measures included as independent measures are available in NAEP; only the dependent measures are absent from NAEP.

For example, what is the relationship between the NAEP-like social context measures and family income? The first two rows of Table 5.2 show that other social context measures explain between about one-quarter to one-third of the variance in income. When family income is regressed on other demographic and family measures (e.g., parent education, single parent household, and mother's labor force participation), the R^2 is .25, and when further measures for school and community are added to the regression, the R^2 increased to .31. Because our analyses in the previous section showed that income has a strong unadjusted association with low test scores and a weak one once other social context measures are taken into account, that part of family income that is important for predicting low scores is about one-third. Therefore, if a purpose of the NAEP is to track the test scores of poor students or poor schools, adding family income data is essential.

Table 5.2

Relationships Between Specific Family and Sets of Social Context Measures Presently in NAEP

Ordinary Regression Model	Adjusted R^2
Income on demographic & other family characteristics	.25
Income on all other social context measures	.31
Family size on demographic & family characteristics	.07
Family size on all other social context measures	.07
Mother's age at child's birth on demographic & family characteristics	.06
Mother's age at child's birth on all other social context measures	.08
Family closure on demographic & family characteristics	.12
Family closure on all other social context measures	.14

The social context measures currently in NAEP do an even worse job of explaining the variance in family measures such as family size, mother's age at birth of the child, and family closure. At most, a little more than one-tenth of the variance is explained by the other social context measures available in NAEP (i.e., the R^2 for family closure is .14).

The relationships among the school measures are much higher, but even so, the extant NAEP measures do not provide good proxy measures for school poverty or school closure. The associations between existing social context measures and global characteristics of schools -- including indicators of socioeconomic status, minority composition, and climate -- are shown in Table 5.3. Two-thirds of the variance in school mean income is explained by other demographic, family, school and community measures ($R^2 = .67$). The extant measures of social context explain about one-half of the variance in school closure ($R^2 = .53$). Although there is a significant degree of collinearity between the school measures in NAEP and those absent from it, a substantial portion of the variance is left unexplained by the NAEP measures. Therefore, , the current NAEP measures are not sufficient proxies for those omitted if the purpose is to identify the *same* groups of students.

Table 5.3 also reveals further collinear relationships among the school measures currently available in NAEP. Between fifty to sixty percent of the variance in the school socioeconomic composition measures (e.g., parent education and percentage of students in school are free or reduced lunch) is explained by existing NAEP social context characteristics. The variance explained in the school minority composition measures is much higher if demographic, family, school, and community measures are included. School mean homework is not explained well by the other social context measures in NAEP ($R^2 = .20$).

Table 5.3

Relationships Between Specific School and Sets of Social Context Measures Presently in NAEP

Ordinary Regression Model	Adjusted R^2
School Socioeconomic Status	
School mean income on other school characteristics	.63
School mean income on all other social context measures	.67
School closure on other school characteristics	.43
School closure on all other social context measures	.53
School mean parent education on other school characteristics	.50
School mean parent education on all other social context measures	.59
% Free lunch on other school characteristics	.51
% Free lunch on all other social context measures	.54
School Minority Composition	
% black on other school characteristics	.26
% black on all other social context measures	.59
% Hispanic on other school characteristics	.25
% Hispanic on all other social context measures	.58
School Climate	
School mean homework on other school characteristics	.17
School mean homework on all other social context measures	.20

86

6. CONCLUSIONS

The primary objective of this study was to assess the adequacy of NAEP's family, school and community measures for describing students at risk of educational failure (i.e., scoring in the bottom quartile or decile of the achievement distribution). NAEP's adequacy, however, depends on the purposes for which the social context measures are used. This study focused on two purposes:

- describing low-achieving students according to this group's family, school, and community characteristics and
- predicting low achievement scores based on students' family, school, and community characteristics.

Our analysis of the latter purpose differs from the majority of existing research that examines the independent effects of social context on mean achievement levels rather than low achievement levels (e.g., bottom quartile or decile). Most of our findings and implications for the NAEP have been discussed in the summary sections of the previous chapters and the summary of this report. However, because of the extent of the various analyses, a few general concluding comments are in order.

For both purposes several measures in NAEP are useful for describing at-risk students. For example, population group characteristics, parents' education attainments, school-level parent education, and school mean homework are measures are important for differentiating low-achieving groups from the population as a whole and for independently predicting low achievement scores.

However, some measures in NAEP that differentiate low-achieving groups do not predict low achievement very well once other factors have been controlled. For example, measures for single parent households, school minority composition, and percentage in the school on free lunch differentiated low-achieving groups from the population, but they were not independently associated with low achievement scores.

For differentiating low-achieving students from the population, NAEP should add measures for family income, family size, mother's age at birth of first child, family closure, student mobility between schools, and school income and closure. Even though these measures do not appreciably add to NAEP's ability to predict low test scores, they are important for providing univariate descriptions of students at risk of educational failure. Although absent from NAEP, grade retention is important for both predicting low achievement and differentiating low achievers as a group.

Our results raise the question whether the existing social context measures in NAEP are adequate proxies for omitted variables such as family income. Here too, the answer depends on the purpose to which the measures are put. If the goal is only to predict the probability that a student will be a low achiever, our analyses suggest that a large enough number of the NAEP social context variables, taken together, are a fairly good proxy for income. That is, adding an income variable to NAEP will not dramatically change its ability to predict the probability of scoring in the bottom quartile. However, further analyses show that for other purposes – for example, to monitor the achievement of poor students – the variables included in the NAEP do not provide an adequate proxy for income. For instance, because family income has a strong unadjusted relationship with low test scores and a weak relationship once other factors are controlled, our analyses show that the portion of family income that matters in predicting the probability of low achievement is one-third of the variance in income that is related to the other social context variables.

The extent of the relationships among the school measures is much greater than the relationships between, for example, family income and other social context characteristics. Even for school measures, however, existing NAEP measures serve as poor proxies if the intent is to describe students according to school poverty (based on aggregated family income) or school closure (e.g., "social capital," or connections among families in the school). At most, two-thirds of the variance of these measures is explained by other demographic, family, school, and community characteristics that are available in NAEP. With such a substantial portion of the variance is left unexplained, the current NAEP can only provide inadequate proxies for these omitted school measures. Therefore, if the aim of NAEP is to allow researchers and policymakers to identify the same low achieving students, then the NAEP currently contains inadequate proxy measures for both family and school contexts.

BIBLIOGRAPHY

Alexander, K. L., and A. M. Pallas. (1985). "School Sector and Cognitive Performance: When is a Little a Little?" *Sociology of Education* 58, 115-128.

Alexander, K. L., E. L. McDill, J. Fennessy, R. J. D'Amico. (1979). "School SES Influences -- Composition or Context? *Sociology of Education*, 52, 222-37.

Alwin, Duane F. (1991). "Family of Origin and Cohort Differences in Verbal Ability," *American Sociological Review* 56:625-638.

Alwin, Duane F., Luther B. Otto. (1977). "High School Context Effects on Aspirations." *Sociology of Education*, 50, 259-73.

Anderson, Judith, Debra Hollinger, and Joseph Conaty. (1992). "Poverty and Achievement: Re-examining the Relationship Between School Poverty and Student Achievement." Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Astone, N. M., and S. S. McLanahan. (1991). "Family Structure, Parental Practices and High School Completion." *American Sociological Review*, 56, 309-320.

Bane, Mary Jo. (1986). "Household Composition and Poverty." Pp. 209-231 in *Fighting Poverty: What Works and What Doesn't* edited by S. H. Danziger and D. H. Weinberg. Cambridge, MA: Harvard University Press.

Bane, Mary Jo, and David T. Ellwood. (1986). "Slipping in and Out of Poverty: The Dynamics of Spells." *Journal of Human Resources*, 21(1), 1-23.

Bane, M. J., and D. T. Ellwood. (1989). "One Fifth of the Nation's Children: Why are They Poor?" *Science*, 245, 1047-1053.

Barron, Sheila I., and Daniel M. Koretz. (In press). "An Evaluation of the Robustness of the NAEP Trend Lines for Racial/Ethnic Subgroups." *Educational Assessment*.

Baumrind, D. (1968). "Authoritarian vs. Authoritative Parental Control." *Adolescence*, 3, 255-272.

Baumrind, D. (1978). "Parental Disciplinary Patterns and Social Competence in Children." *Youth and Society*, 9(3), 239-276.

Belmont, Lillian, Patricia Cohen, Joy Dryfoos, Zena Stein, and Susan Zayac. (1981). "Maternal Age and Children's Intelligence." Pp. 177-94 in *Teenage Parents and Their Offspring*, edited by K. Scott, T. Field, and E. Robertson. New York: Ford Foundation.

Bempechat, J., and H. P. Ginsburg. (1989). *Underachievement and Educational Disadvantage: The Home and School Experience of At-Risk Youth*. New York: ERIC Clearinghouse on Urban Education.

Berends, M., and D. Koretz. (In press). "Reporting Minority Students' Test Scores: Can the NAEP Account for Differences in Social Context?" *Educational Assessement*.

Berends, M., D. Koretz, and E. Lewis. (1994). *Measuring Racial and Ethnic Test Score Differences: Can the NAEP Account for Dissimilarities in Social Context?* Santa Monica, RAND, DRU-662-ED.

Bishop, J. (1989). "Is the Test Score Decline Responsible for the Productivity Growth Decline?" *American Economic Review*, 79, 178-197.

Blake, Judith. (1989). *Family Size and Achievement*. Berkeley: University of California Press.

Blalock, Hubert M. (1984). "Contextual-Effects Models: Theoretical and Methodological Issues." *Annual Review of Sociology*, 10, 353-372.

Bourdieu, Pierre. (1984). *Distinction*. Cambridge, MA: Harvard University Press.

Bourdieu, Pierre, and Jean-Claude Passeron. (1977). *Reproduction in Education, Society and Culture*. London: Sage Publications.

Bradley, R. H. 1985. "The Home Inventory: Rationale and Research." Pp. 191-201 in *Recent Research in Developmental Psychopathology*, edited byJ. Lachenmeyer and M. Gibbs. Gardner, NY: Book Supplement to the Journal of Child Psychology and Psychiatry.

Brooks-Gunn, Jeanne, Greg J. Duncan, Pamela Kata Klebanov, and Naomi Sealand. (1993). "Do Neighborhoods Influence Child and Adolescent Development?" *American Jouranl of Sociology*, 99(2), 353-394.

Bryk, A. S., and M. E. Driscoll. (1988). *The High School as Community: Contextual Influences, and Consequences for Students and Teachers*. Madison: National Center on Effective Secondary Schools, University of Wisconsin.

Bryk, A. S., V. E. Lee, and P. B. Holland. (1993). *Catholic Schools and the Common Good.* Cambridge, MA: Harvard University Press.

Bryk, A. S., V. E. Lee, and J. B. Smith. (1993). "High School Organization and Its Effects on Teachers and Students: An Interpretive Summary of the Research." Pp. 135-226 in *Choice and Control in Education, Volume 1*, edited by W. H. Clune and John F. Witte. New York: The Falmer Press.

Bryk, A., and S. W. Raudenbush. (1992). *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, CA: Sage Publications.

Bryk, A. S., and Thum, Y. M. (1989). "The Effects of High School Organization on Dropping Out: An Exploratory Investigation." *American Educational Research Journal*, 26(3), 353-383.

Caplan, Nathan, Marcella H. Choy, and John K. Whitmore. (1991). *Children of the Boat People: A Study of Educational Success*. Ann Arbor, MI: The University of Michigan Press.

Caplan, Nathan, Marcella H. Choy, and John K. Whitmore. (1992). "Indochinese Refugee Familiers and Academic Achievement." *Scientific American*, 266(2), 36-42.

Catterall, J. S. (1985). "On the Social Costs of Dropping Out of School." Palo Alto, CA: Stanford Education Policy Institute.

Chambers, J. G. (1981). "An Analysis of School Size Under a Voucher System." *Educational Evaluation and Policy Analysis*, 3, 29-40.

Coleman, James S. (1988). "Social Capital in the Creation of Human Capital." *American Journal of Sociology*, 94, s95-s120.

Coleman, James S., E. Campbell, C. Hobson, J. McPartland, A. Mood, F. Weinfield, and R. York. (1966). *Equality of Educational Opportunity*. Washington, DC: U.S. Government Printing Office.

Coleman, James S., Thomas B. Hoffer, and Sally Kilgore. (1982). *High School Achievement: Public, Catholic, and Private Schools Compared*. New York: Basic

Coleman, J. S. and T. Hoffer. (1987) *Public and Private High Schools: The Impact of Communities*. New York: Basic Books.

Conant, J. B. (1961). *Slums and Suburbs*. New York: McGraw-Hill.

Corcoran, Mary E, and Sheldon H. Danziger. (in press). "Rags to Rags: Poverty and Mobility in the U.S." *Annual Review of Sociology*.

Crain, R. L., and R. E. Mahard. (1978). "School Racial Composition and Black College Attendance and Achievement Test Preformance." *Sociology of Education*, 51, 81-101.

Crane, J. (1991a). "Effects of Neighborhood on Dropping Out of School and Teenage Childbearing." Pp. 299-320 in *The Urban Underclass*, edited by C. Jencks and P. E. Peterson. Washington, DC: The Brookings Institution.

Crane, J. (1991b). "The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage childbearing." *American Journal of Sociology*, 96(5), 1225-1259.

Danziger, Sheldon H., Gary D. Sandefur, and Daniel H. Weinberg. (1994). (Editors). *Confronting Poverty: Prescriptions for Change*. Cambridge, MA: Harvard University Press.

Delgado-Gaitan, Concha. (1991). "Involving Parents in the Schools: A Process of Empowerment." *American Journal of Education*, 100(1), 20-46.

Delgado-Gaitan, Concha. (1992). "School Matters in the Mexican-American Home: Socializing Children to Education." *American Educational Research Journal*, 29(3), 495-513.

Desai, Sonalde, P. Lindsay Chase-Lansdale, and Robert T. Michael. (1989). "Mother or Market? Effects of Maternal Employment on the Intellectual Ability of 4-Year-Old Children." *Demography*, 26, 545-561.

Diprete, Thomas A., and Jerry D. Forristal. (1994). "Multilevel Models: Methods and Substance." *Annual Review of Sociology*, 20, 331-357.

Dornbusch, S. M., P. L. Ritter, P. H. Leiderman, D. F. Roberts, and M. J. Fraleigh. (1987). "The Relation of Parenting Style to Adolescent School Performance." *Child Development*, 58, 1244-1257.

Duncan, Beverly. (1968). "Trends in Output and Distribution of Schooling." Pp. 601-672 in *Indicators of Social Change: Concepts and Measurements*, edited by E. B. Sheldon and W. E. Moore. New York: Russell Sage Foundation.

Duncan, Otis Dudley. (1961). "A Socioecnomic Index for All Occupations." Pp. 109-138 in *Occupations and Social Status*, edited by A. J. Reiss, Jr. New York: Free Press.

Ebata, A. T., A. C. Peterson, and J. J. Conger. (1990). "The Development of Psychopathology in Adolescence." In *Risk and Protective Factors in the Development of Psychopathology*, edited by J. Rolf, A. S. Masten, D. Cicchetti, K. Nuechterlein, and S. Weintraub. Cambridge: Cambridge University Press.

Eccles, J. S., L. W. Hoffman. (1985). "Sex Roles, Socialization, and Occupational Behavior." Pp. 367-420 in *Research in Child Development and Social Policy, vol. 1*, edited by H. W. Stevenson and A. E. Siegel. Chicago: University of Chicago Press.

Ellwood, David T. (1988). *Poor Support: Poverty in the American Family*. New York: Basic Books.

Ellwood, David T., and Jonathan Crane. (1990). "Family Change Among Black Americans: What Do We Know?" *Journal of Economic Perspectives*, 4(4), 65-84.

Entwisle, Doris R., and Karl L. Alexander. (1992). "Summer Setback: Race, Poverty, School Composition, and Mathematics Achievement in the First Two Years of School." *American Sociological Review*, 57, 72-84.

Epstein, Joyce L. 1990. "School and Family Connections: Theory, Research, and Implications for Integrating Sociologies of Education and Family." *Marriage and Family Review* 15:99-126.

Farley, Reynolds, and Walter R. Allen. (1987). *The Color Line and the Quality of Life in America*. New York: Russell Sage Foundation.

Featherman, David L., and Robert M. Hauser. (1978). *Opportunity and Change*. New York: Academic Press.

Finn, Jermy D. (1989). "Withdrawing from School." *Review of Educational Research*, 59, 117-142.

Foertsch, Mary A. (1992). *Reading In and Out of School.* Washington, DC: National Center for Education Statistics.

Gamoran, Adam. (1993). "Academic Achievement in American Cities: Comparison of Public Comprehensive, Public Magnet, Catholic, and Non-Religious Private High Schools." Paper presented at the Annual Meeting of the American Sociological Association, Miami.

Gamoran, A. (1992). "Social Factors in Education." Pp. 1222-1229 in *Encyclopedia of Educational Research*, edited by M. Alkin. New York: Macmillan.

Gamoran, A. (1989). "Measuring Curriculum Differentiation." *American Journal of Education* 97:129-143.

Gamoran, A. (1987). "The Stratification of High School Learning Opportunities." *Sociology of Education* 60:135-155.

Gamoran, Adam, and Robert D. Mare. (1989). "Secondary School Tracking and Educational Inequality: Reinforcement, Compensation, or Neutrality?" *American Journal of Sociology* 94:1146-1183.

Gans, Herbert J. (1990). "Deconstructing the Underclass: The Term's Danger as a Planning Concept." *Journal of the American Planning Association*. 56: 271-277.

Garner, Catherine L., and Stephen W. Raudenbush. (1991). "Neighborhood Effects on Educational Attainment: A Multilevel Analysis." *Sociology of Education*, 64, 251-262.

Glazer, Nathan. (1986). "Education and Training Programs and Poverty." Pp. 152-173 in *Fighting Poverty: What Works and What Doesn't* edited by S. H. Danziger and D. H. Weinberg. Cambridge, MA: Harvard University Press.

Goldberger, A. R., and G. G. Cain. (1982). "The Causal Analysis of Cognitive Outcomes in the Coleman, Hoffer and Kilgore Report." *Sociology of Education*, 55, 103-22.

Gottfried, Adele Eskeles, Allen W. Gottfried, and Kay Bathhurst. (1988). "Maternal Employment, Family Environment, and Children's Development: Infancy through the School Years" Pp. 32-51 in *Maternal Employment and Children's Development: Longitudinal Research*, edited by Adele E. Gottfried and Allen W. Gottfried. New York, NY: Plenum Press.

Grissmer, David W., Sheila Nataraj Kirby, Mark Berends, and Stephanie Williamson. 1994. *Student Achievement and the Changing American Family*. Santa Monica, CA: RAND (MR-488-LE).

Grissmer, David W., Sheila Nataraj Kirby, Mark Berends, and Stephanie Williamson. (1995). "Multiple Risk Effects of Demographic, Family, and Other Factors on Cognitive Achievement." Paper presented at the 7th International Conference on Socio-Economics of the Society for the Advancement of Socio-Economics, Washington, DC.

Haffner, A., S. Ingels, B. Schneider, and D. Stevenson. (1990). *A Profile of the American Eighth Graders: NELS:88 Student Descriptive Summary*. Washington, DC: US Department of Education, National Center for Education Statistics.

Hanushek, E. A. (1986). "The Economics of Schooling: Production and Efficiency in Public Schools." *Journal of Economic Literature*, 24, 1141-1177.

Hanushek, Eric A. (1992). "The Trade-off Between Child Quantity and Quality," *Journal of Political Economy*, 100:84-117.

Hauser, Robert M. (1970). "Context and Consex: A Cautionary Tale." *American Journal of Sociology* 75:645-664.

Hauser, Robert M., and David L. Featherman. (1976). "Equality and Schooling: Trends and Prospects." *Sociology of Education*, 49, 99-120.

Hetherington, E. Mavis, Kathleen Camara, and David L. Featherman. (1981). *Cognitive Performances, School Behavior, and Achievement of Children from One-Parent Households*. Washington, DC: National Institute of Education.

Hill, M. Ann, and June O'Neill. (1994). "Family Endowment and the Achievement of Young Children with Special Reference to the Underclass." *Journal of Human Resources* 29(4):1065-1100.

Hoffer, Thomas B. (1992). "Effects of Community Type on School Experience and Student Learning: Are Urban Schools Really Different?" Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Hoffer, Thomas B, and Whitney Moore. (In press). *High School Seniors' Instructional Experiences in Science and Mathematics.* Washington, DC: US Department of Education, National Center for Education Statistics.

Hoffman, Lois Wladis. (1989). "Effects of Maternal Employment in the Two-Parent Family." *American Psychologist* 44:283-292.

Ingels, S. J., S. Y. Abraham, R. Karr, B. D. Spencer, and M. R. Frankel. (1990). *National Education Longitudinal Study of 1988: Data File User's Manual.* Washington, DC: US Department of Education, National Center for Education Statistics.

Kaufman, P., and K. A. Rasinski. (1991). *National Education Longitudinal Study of 1988: Quality of the Responses of Eighth-Grade Students in NELS:88.* Washington, DC: US Department of Education, National Center for Education Statistics.

Jencks, C. (1992). *Rethinking Social Policy: Race, Poverty, and the Underclass.* Cambridge, MA: Harvard University Press.

Jencks, C. (1991). "Is the American Underclass Growing?" Pp. 28-100 in *The Urban Underclass*, edited by C. Jencks and P. E. Peterson. Washington, DC: The Brookings Institution.

Jencks, C. S. (1985). "How Much Do High School Students Learn?" *Sociology of Education*, 58, 128-135.

Jencks, Christopher S., and Susan E. Mayer. (1990). "The Social Consequences of Growing Up in a Poor Neighborhood." In *Inner-City Poverty in the United States*, edited by L. E. Lynn, Jr. and J. G. H. McGeary. Washington , DC: National Academy.

Jencks, Christopher S., Susan Bartlett, Mary Corcoran, James Crouse, David Eaglesfield, Gregory Jackson, Kent McClelland, Peter Mueser, Michael Olneck, Joseph Schwartz, Sherry Ward, and Jill Williams. (1979). *Who Gets Ahead? The Determinants of Economic Success in America.* New York: Basic Books.

Jencks, Christopher S., and Marsha Brown. (1975). "Effects of High Schools on Their Students." *Harvard Educational Review* 45:273-324.

Jencks, Christopher S., Marshall Smith, Henry Acland, Mary Jo Bane, David Cohen, Herbert Gintis, Barbara Heyns, Stephan Michelson. (1972). *Inequality: A Reassessment of the Effect of Family and Schooling in America.* New York: Basic Books.

Johnson, E. G., and N. L. Allen. (1992). *The NAEP 1990 Technical Report.* Washington, DC: National Center for Education Statistics.

Kaufman, P., and D. Badby. (1992). *Characteristics of At-Risk Students in NELS:88.* Washington, DC: US Department of Education, National Center for Education Statistics.

Kennedy, Eugene. (1992). "A Multilevel Study of Elementary Male Black Students and White Students." *Journal of Educational Research*, 86(2), 105-110.

Klein, S. (1985). (Editor). *Handbook for Achieving Sex Equity through Education.* Baltimore, MD: Johns' Hopkins University Press.

Kohn, Melvin L., and Carmi Schooler. 1983. *Work and Personality: An Inquiry Into the Impact of Social Stratification.* New York: Ablex Publishing Corporation.

Koretz, Daniel M. (1992). "What Happened to Test Scores, and Why?," *Educational Measurement: Issues and Practice* 11(4):7-11.

Koretz, Daniel. (1986). *Trends in Educational Achievement.* Washington, DC: Congressional Budget Office.

Krein, Sheila Fitzgerald, and Adrea H. Beller. (1988). "Educational Attainment of Children from Single-Parent Families: Differences by Exposure, Gender, and Race." *Demography* 25:221-234.

Johnson, E. G., and N. L. Allen. (1992). *The NAEP 1990 Technical Report.* Washington, DC: National Center for Education Statistics.

Lareau, A. (1989). *Home Advantage*. New York: The Falmer Press.

Lee, Valerie E., Anthony S. Bryk, and Julia Smith. (1993). "The Organization of Effective Secondary Schools." *Review of Research in Education* 19:171-267.

Lee, Valerie E., and Julia B. Smith. (1993). "Effects of School Restructuring on the Achievement and Engagement of Middle-grade Students." *Sociology of Education*, 66, 164-187.

Lee, Valerie E., and Anthony S. Bryk. (1989). "A Multilevel Model of the Social Distribution of High School Achievement." *Sociology of Education*, 62, 172-192.

Levin, H. M. (1994). "Economic of School Reform for At-Risk Students." Unpublished manuscript. Stanford University, School of Education, Stanford, CA.

Levin, H. M. (1985). "The Educationally Disadvantaged: A National Crisis." (Working Paper #6). Philadelphia, PA: Public Private Ventures.

Levin, H. M. (1986). "The Educationally Disadvantaged Are Still Among Us." Unpublished manuscript. Stanford University, School of Education, Stanford, CA.

Levin, H. M. (1989). "Economics of Investment in Educationally Disadvantaged Students." *American Economics Association Papers and Proceedings*, 79(2), 52-56.

Levin, H. M. (1972). *The Costs to the Nation of Inadequate Education*. Washington, DC: U.S. Government Printing Office.

Lipmann, Laura. (1993). "NAEP Type of Community Variable." Unpublished memo. Washington, DC: US Department of Education, National Center for Education Statistics.

Lindert, Peter H. (1977). "Sibling Position and Achievement." *The Journal of Human Resources* 12(2):198-219.

Linn, Robert L., and Stephen B. Dunbar. (1990). "The Nation's Report Card Goes Home: Good News and Bad About Trends in Achievement." *Phi Delta Kappan*, 71, 127-133.

Mahard, R. E., and R. L. Crain. (1983). "Research on Minority Achievement in Desegregated Schools. Pp. 103-105 in *The Consequences of School* Desegregation, edited by C. H. Rossell and W. D. Hawley. Philadelphia: Temple University.

98

Maier, Mark H. (1991). *The Data Game: Controversies in Social Science Statistics.* New York: M. E. Sharpe, Inc.

Manski, C. F. (1994). "Identification Problems in the Social Sciences." *Sociological Methodology*, 23, 1-56.

Masten, A. S. (1994). "Resilience in Individual Development: Successful Adaptation Despite Risk and Adversity." Pp. 3-25 in *Educational Resilience in Inner-City America,* edited by M. C. Wang and E. W. Gordon. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Mayer, Susan E. (1991). "How Much Does a High Schools' Racial and Socioeconomic Mix Affect Graduation and Teenage Fertility Rates?" Pp. 321-341 in *The Urban Underclass,* edited by C. Jencks and P. E. Peterson. Washington, DC: The Brookings Institution.

Mayer, S., and C. Jencks. (1989). "Growing Up in Poor Neighborhoods: How Much Does It Matter?" *Science*, 17, 1441-1445.

McArthur, Edith K. (1993). *Language Characteristics and Schooling in the United States, A Changing Picture: 1979 and 1989.* Washington, DC: US Department of Education, National Center for Education Statistics.

McCarthy, C. (1990). *Race and Curriculum: Social Inequality and the Theories and Politics of Difference in Contemporary Research on Schooling.* New York: The Falmer Press.

McDonnell, Lorraine M., and Paul T. Hill. (1993). *Newcomers in American Schools: Meeting the Educational Needs of Immigrant Youth.* Santa Monica, CA: RAND, MR-103-AWM/PRIP.

McLanahan, Sara, and Gary Sandefur. (1994). *Growing Up with a Single Parent: What Hurts, What Helps.* Cambridge, MA: Harvard University Press.

McDill, E. L., G. Natriello, and A. M. Pallas. (1986). "A Population At Risk: Potential Consequences of Tougher School Standards for Student Dropouts." *American Journal of Education*, 94, 135-181.

Menaghan, Elizabeth G., and Toby L. Parcel. (1991). "Determining Children's Home Environments: The Impact of Maternal Characteristics and Current Occupational and Family Conditions." *Journal of Marriage and the Family* 53:417-431.

Meyer, John W. (1970). "High School Effects on College Intentions." *American Journal of Scoiology*, 76, 59-70.

Mickleson, Roslyn Arlin. (1989). "Why Does Jane Read and Write So Well? The Anomaly of Women's Achievement." *Sociology of Education*, 61(1), 47-63.

Milne, Ann M., Myers, and Rosenthal. (1986). "Single Parents, Working Mothers, and the Educational Achievement of School Children." *Sociology of Education* 5:125-139.

Moore, Kristin A., and Nancy O. Snyder. (1991). "Cognitive Achievement Among First-Born Children of Adolescent Mothers." *American Sociological Review* 56:612-624.

Morra, Linda G. (1994). "School-Age Children: Poverty and Diversity Challenge School Nation Wide." Testimony before the Committee on Labor and Human Resources, U. S. Senate. Washington, DC: US General Accounting Office.

Mulkey, Lynn M., Robert L. Crain, and Alexander J.C. Harrington. (1992). "One-Parent Households and Achievement: Economic and Behavioral Explanations of a Small Effect." *Sociology of Education*, 65, 48-65.

Mullis, Ina V. S., John A. Dossey, Jay R. Campbell, Claudia A. Gentile, Christine O'Sullivan, and Andrew S. Latham. (1994). *NAEP 1992 Trends in Academic Progress*. Washington, DC: US Department of Education, National Center for Education Statistics.

Mullis, Ina V.S., John A Dossey, Eugene H. Owen, Gary W. Phillips. (1991). *The State of Mathematics Achievement*. Washington, DC: National Center for Education Statistics.

Murphy, Joseph. (1991). *Restructuring Schools: Capturing and Assessing the Phenomena*. New York: Teachers College Press.

Myers, David E. "The Relationship Between School Poverty Concentration and Students' Reading and Math Achievement and Learning." Washington, DC: Decision Resources Corporation.

National Assessment of Educational Progress. (1989). *Reading Objectives 1990 Assessment.* Princeton, NJ: Educational Testing Service.

National Assessment of Educational Progress. (1988). *Mathematics Objectives 1990 Assessment.* Princeton, NJ: Educational Testing Service.

National Coalition of Advocates for Students. (1988). *New Voices: Immigrant Students in U. S. Public Schools.* Boston, MA: Author.

Natriello, G., E. L. McDill, and A. M. Pallas. (1990). *Schooling Disadvantaged Children: Racing Against Catastrophe.* New York: Teachers College Press.

Newmann, Fred M. (1981). "Reducing Student Alienation in High Schools: Implications of Theory." *Harvard Educational Reveiw,* 51(4), 546-64.

O'Day, J. A., and M. S. Smith. (1993). "Systemic Reform and Educational Opportunity." Pp. 250-312 in *Designing Coherent Policy: Improving the System,* edited by S. Fuhrman. San Francisco: Jossey-Bass.

Office of Research and Improvement. (1993). *Educational Reforms and Students at Risk: A Review of the Current State of the Art.* Washington, DC: U.S. Deparment of Education.

Ogbu, J. (1979). *Minority Education and Caste: The American System in Cross-Cultural Perspective.* New York: Academic Press.

Ogbu, J. (1989). "The Individual in Collective Adaptation: A Framework for Focusing on Academic Underperformance and Dropping Out Among Involuntary Minorities." Pp. 181-204 in *Dropouts from Schools: Issues, Dilemmas and Solutions,* edited by L. Weis, E. Farrar, and H. G. Petrie. Buffalo, NY: State University of New York Press.

Ogbu, J. (1992). "Understanding Cultural Diversity and Learning." *Educational Researcher,* 21(8), 5-14, 24.

Omni, M., and H. Winant. *Racial Formation in the United States: From the 1960s to the 1990s.* New York: Routledge.

Pallas, A. M., G. Natriello, and E. L. McDill. (1989). "The Changing Nature of the Disadvantaged Population: Current Dimensions and Future Trends." *Educational Researcher,* 18(5), 16-22.

Parcel, Toby L., and Elizabeth G. Menaghan. (1990). "Maternal Working Conditions and Children's Verbal Facility: Studying the Intergenerational Transmission of Inequality from Mothers to Young Children." *Social Psychology Quarterly* 53:132-147.

Plomin, Robert. 1986. *Development, Genetics, and Psychology*. Hillsdale, NY: Laurence Erlbaum.

Porter, Andrew C. (1991). "Creating a System of School Process Indicators." *Education, Evaluation, and Policy Analysis* 13: 13-29.

Rock, Donald A., and Judith Pollack. (1991). *Psychometric Report of the NELS:88 Base Year Test Battery*. Washington, DC: US Department of Education, National Center for Education Statistics.

Rolf, John, Ann S. Mastern, Dante Cicchetti, Keith H. Nuechterlein, and Sheldon Weintraub. (1990). (Editors). *Risk and Protective Factors in the Development of Psychopathology*. Cambridge: Cambridge University Press.

Rumberger, Russell W. (1994). "Dropping Out of Middle School: A Multilevel Analysis of Students and Schools." Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

Rumberger, Russell W. (1987). "School Dropouts: A Review of Issues and Evidence." *Review of Educational Research*, 57(2), 101-127.

Rutter, M. (1984). "Continuities and Discontinuities in Socioemotional Development." Pp. 41-68 in *Continuities and Discontinuities in Development*, edited by R. N. Emde and R. J. Harmon. New York: Plenum Press.

Rutter, M. (1989). "Pathways from Childhood to Adult Life." *Journal of Child Psychology and Psychiatry*, 30(1), 23-51.

Rutter, M. (1990). "Psychosocial Resilience and Protective Mechanisms." Pp. 181-214 in *Risk and Protective Factors in the Development of Psychopathology*, edited by J. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, and S. Weintraub. Cambridge: Cambridge University Press.

Rutter, M., B. Maughan, P. Mortimore, J. Ouston, and A. Smith. (1979). *Fifteen Thousand Hours: Secondary Schools and Their Effects on Children*. Cambridge, MA: Harvard University Press.

Sander, William, and Anthony C. Krautmann. (1995). "Catholic Schools, Dropout Rates and Educational Attianment." *Economic Inquiry*, 33, 217-233.

Schorr, L. B. (1988). *Within Our Reach: Breaking the Cycle of Disadvantage*. New York: Anchor Books.

Schneider, B., and J. S. Coleman. (1993). (Editors). *Resources and Actions: Parents, Their Children and Schools*. Boulder, CO: Westview.

Sewell, W. H., and R. M. Hauser. (1993). "A Review of the Wisconsin Longitudinal Study of Social and Psychological Factors in Aspriations and Achievements 1963-1992." CDE Working Paper 92-1. Center for Demography and Ecology: University of Wisconsin-Madison.

Sewell, W. H., and R. M. Hauser. (1980). "The Wisconsin Longitudinal Study of Social and Psychological Factors in Aspirations and Achievements." Pp. 59-100 in *Research in Sociology of Education and Socialization*, edited by A. C. Kerckhoff. Greenwich, CT: JAI Press.

Sewell, W. H., and R. M. Hauser. (1975). *Education, Occupation, and Earnings: Achievement in the Early Career*. New York: Academic Press.

Shavelson, Richard J., Lorraine M. McDonnell, and Jeannie Oakes. (1989). (Editors). *Indicators for Monitoring Mathematics and Science Education: A Sourcebook*. Santa Monica, CA: RAND.

Slavin, R. E. (1990). "Achievement Effects of Ability Grouping in Secondary Schools: A Best-Evidence Synthesis." *Review of Educational Research*, 60, 471-499.

Smith, Marshall S. (1995). "Systemic Reform: The Importance of Goals 2000 and the Reform Legislation." Keynote address at the conference on "Implementing Recent Federal Legislation" St. Pete Beach, FL.

Smith, Marshall S., and Jennifer O'Day. (1991a). "Educational Equality: 1966 and Now." In *The 1990 American Education Finance Association Yearbook: Spheres of Justice in Education,* edited by D. A. Verstegen and J. G. Ward. Washington, DC: American Education Finance Association.

Smith, Marshall S., and Jennifer O'Day. (1991b). "Systemic School Reform." In *The Politics of Curriculum and Testing,* edited by S. Fuhrman and B. Malen. New York: Falmer.

Steinberg, L., J. D. Elmen, and N. Mounts. (1989). "Authoritative Parenting, Psychosocial Maturity, and Academic Success among Adolescents." *Child Development,* 60, 1424-1435.

Steinkamp, M. W., and M. L. Maehr. (1984). "Gender Differences in Motivational Orientation toward Achievement in School Science: A Quantitative Synthesis." *American Educational Research Journal,* 21(1), 39-59.

Stevenson, David L., and David P. Baker. (1987). "The Family-School Relation and the Child's School Performance." *Child Development,* 58, 1348-1357.

Stevenson, Harold W., and James W. Stigler. (1992). *The Learning Gap: Why Our Schools are Failing and What We can Learn from Japanese and Chinese Education.* New York: Summit Books.

U.S. Bureau of the Census. (1989). "Poverty in the United States." In *Current Population Reports.* Series P-60, no. 163. Washington DC: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (1994). *The Condition of Education 1994.* Washington DC: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (1993). *Youth Indicators 1993.* Washington, DC: U.S. Government Printing Office.

U.S. Department of Education, National Center for Education Statistics. (1991). *Trends in Academic Achievement.* Washington, DC: U.S. Government Printing Office.

Vernez, Georges, and David Ronfeldt. (1991). "The Current Situation in Mexican Immigration." *Science,* 251, 1189-1193.

Wacquant, Loic J. D., and William Julius Wilson. (1993). "The Cost of Racial and Class Exclusion in the Inner City." Pp. 25-42 in *The Ghetto Underclass: Social Science Perspectives*, edited by W. J. Wilson. Newbury Park: Sage.

Wang, M. C., and E. W. Gordon. (1994). *Educational Resilience in Inner-City America.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Wehlage, G. G., R. A. Rutter, G. Smith, N. Lesko, and R. R. Fernandez. (1989). *Reducing the Risk: Schools as Communities of Support.* New York: The Falmer Press.

Wells, Amy Stuart, and Robert L. Crain. (1994). "Perpetuation Theory and the Long-Term Effects of School Desegregation." *Review of Educational Research*, 64(4), 531-555.

Werner, Emmy E., and Ruth S. Smith, (1992). *Overcoming the Odds: High Risk Children from Birth to Adulthood.* Ithaca, NY: Cornell University Press.

Wilson, A. B. (1959). "Residential Segregation of Social Classes and Aspirations of High School Boys." *American Sociological Review*, 24, 836-845.

Wilson, W. J. (1991). "Studying Inner-City Social Dislocations: The Challenge of Public Agenda Research." *American Sociological Review*, 56, 1-14.

Wilson, W. J. (1987). *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy.* Chicago, IL: The University of Chicago Press.

Wilson, William Julius, and Kathryn M. Neckerman. (1986). "Poverty and Family Structure: The Widening Gap between Evidence and Public Policy Issues." Pp. 232-259 in *Fighting Poverty: What Works and What Doesn't* edited by S. H. Danziger and D. H. Weinberg. Cambridge, MA: Harvard University Press.

Wilson, William Julius. (1993). "The Underclass: Issues, Perspectives, and Public Policy." Pp. 1-24 in *The Ghetto Underclass: Social Science Perspectives*, edited by W. J. Wilson. Newbury Park: Sage.

Table A.1

Percentage of Achievement Groups with Certain Social Context Characteristics in NAEP.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
Demographic Characteristics						
Black	22%	22%	15%	41%	33%	15%
Hispanic	18%	16%	10%	20%	18%	10%
White	58%	59%	70%	35%	46%	70%
Female	28%	36%	50%	48%	49%	50%
Family Characteristics						
Mother High School or Less	66%	62%	50%	69%	68%	48%
Father High School or Less	62%	58%	44%	68%	67%	43%
Mother is Single Parent	22%	21%	17%	27%	25%	18%
Mother Works Part Time	23%	21%	22%	19%	20%	21%
Mother Works Full Time	51%	54%	53%	50%	51%	53%
Language Use and Immigration Status Characteristics						
Never Speak Language Other than English	68%	68%	69%	63%	66%	70%
Sometimes Speak Language Other than English	24%	24%	24%	25%	23%	23%
Always Speak Language Other than English	8%	8%	7%	12%	11%	7%
Academic Characteristics						
Homework < 1.5 hours per week	33%	25%	14%	26%	22%	14%

Table A.1 (continued)

Percentage of Achievement Groups with Certain Social Context Characteristics in NAEP.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
School Characteristics						
Private School	3%	4%	11%	4%	5%	11%
School Percent Free Lunch > 50%	13%	15%	12%	24%	21%	12%
School Percent Minority > 25%	44%	47%	40%	74%	64%	41%
School Mean Parent Education 13 Years of Less	46%	46%	35%	54%	49%	33%
School Mean Homework < 5 hours/week	27%	23%	19%	24%	24%	20%

Table A.1 (continued)
Percentage of Achievement Groups with Certain Social Context Characteristics in NAEP.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
Community Characteristics						
Urban Locale						
Urban	24%	23%	24%	32%	29%	26%
Rural	44%	43%	44%	32%	37%	43%
Suburban	32%	34%	32%	36%	34%	31%
Size and Type of Community (STOC)						
Extreme Rural	11%	12%	12%	12%	13%	11%
Low Metropolitan	11%	11%	9%	18%	17%	10%
High Metropolitan	5%	5%	11%	2%	4%	11%
Big City	9%	9%	9%	13%	11%	9%
Urban Fringe	11%	12%	12%	12%	11%	11%
Medium City	15%	13%	12%	11%	11%	12%
Small Place	38%	38%	36%	32%	34%	35%
Region of the Country						
South	16%	16%	21%	13%	16%	21%
Northeast	28%	29%	24%	39%	34%	24%
North Central	25%	23%	25%	17%	21%	25%
West	31%	32%	30%	31%	29%	30%

Table A.2

Percentage of Achievement Groups with Certain Social Context Characteristics in NELS.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
Demographic Characteristics						
Black	26%	23%	13%	27%	26%	13%
Hispanic	15%	14%	9%	17%	15%	9%
White	53%	58%	73%	52%	54%	73%
Female	40%	42%	50%	47%	50%	50%
Family Characteristics						
Mother High School or Less	60%	58%	43%	62%	58%	43%
Father High School or Less	60%	59%	43%	65%	61%	43%
Mother is Single Parent	23%	21%	16%	23%	22%	16%
Mother Works Part Time	15%	14%	18%	13%	14%	18%
Mother Works Full Time	50%	50%	51%	50%	50%	51%
Family Income < $15,000	38%	35%	20%	41%	37%	20%
More than Two Siblings	44%	43%	34%	43%	42%	34%
Mother's Age at Child's Birth ≤ 20	20%	20%	13%	22%	20%	13%
Family closure ≤ 2 of Child's Friends Known by Parent	39%	37%	16%	41%	38%	16%

Table A.2 (continued)

Percentage of Achievement Groups with Certain Social Context Characteristics in NELS.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
Language Use and Immigration Status Characteristics						
Spanish Usually Spoken At Home	10%	9%	5%	11%	10%	5%
Other Non-English Language Usually Spoken at Home	4%	3%	3%	3%	3%	3%
Student Was Born Outside US	6%	6%	5%	6%	5%	5%
Mother Was Born Outside US	13%	12%	11%	13%	12%	11%
Academic Characteristics						
Change Schools More than Once	39%	38%	32%	40%	39%	32%
Ever Held Back	42%	38%	19%	47%	41%	19%
GPA < C Average	34%	30%	16%	36%	31%	16%
Homework < 1.5 hours per week	16%	15%	10%	18%	15%	10%

Table A.2 (continued)

Percentage of Achievement Groups with Certain Social Context Characteristics in NELS.

	Reading			Mathematics		
	Bottom Decile	Bottom Quartile	Population	Bottom Decile	Bottom Quartile	Population
School Characteristics						
Private School	6%	6%	12%	7%	7%	12%
School Percent Free Lunch > 50%	27%	26%	16%	10%	25%	16%
School Percent Minority > 25%	54%	52%	37%	58%	56%	37%
School Mean Parent Education 13 Years of Less	37%	36%	23%	43%	37%	23%
School Mean Homework < 5 hours/week	44%	44%	37%	49%	45%	37%
School Mean Income < $25,000	35%	33%	20%	39%	36%	20%
Eighth Grade Class Size < 100	23%	23%	28%	23%	23%	28%
School Mean Social Capital ≤ 2	33%	30%	20%	34%	32%	20%
Community Characteristics						
Urban Locale						
Urban	30%	29%	24%	30%	30	24%
Rural	32%	34%	32%	33%	33%	32%
Suburban	37%	37%	44%	37%	37%	44%
Region of the Country						
South	40%	42%	36%	45%	44%	36%
Northeast	15%	15%	19%	17%	16%	19%
North Central	23%	24%	27%	19%	22%	27%
West	21%	18%	18%	18%	18%	18%

Table B.1

Means and Standard Deviations for Social Context Measures in Logistic Regression Models

Variable Label	Mean	SD
Black	0.127	0.331
Hispanic	0.094	0.290
Other	0.044	0.205
Female	0.501	0.497
Mother's Education Less High School	0.148	0.353
Mother's Education Some College	0.404	0.487
Mother's Education College Graduate	0.160	0.364
Father's Education Less High School	0.163	0.366
Father's Education Some College	0.335	0.469
Father's Education College Graduate	0.238	0.423
Mother is Single Parent	0.162	0.359
Mother Works Part Time	0.510	0.489
Mother Works Full Time	0.176	0.372
Family Income (1987 $00,000s)	3.870	3.504
Number of Siblings	2.264	1.537
Mother's Age at Birth of 8th Grader	25.590	5.865
Family Closure	3.625	1.764
Spanish Usually Spoken at Home	0.054	0.224
Language Other than English Spoken at Home	0.032	0.174
Student was Born Outside U.S.	0.047	0.209
Mother was Born Outside U.S.	0.104	0.299
Change Schools More than Once	0.336	0.469
Ever Held Back	0.192	0.388
Homework Hours/Week	5.724	4.535
Catholic School	0.074	0.259
Other Private School	0.043	0.203
Percent on Free Lunch	24.011	22.909
Percent Black	13.534	23.291
Percent Hispanic	8.407	19.341
School Parent Education	13.710	0.929
School Homework	5.715	1.609
School Income	3.863	2.031
8th Grade Class Size	204.974	127.685
School Closure	3.579	0.747
Urban	0.239	0.423
Rural	0.326	0.466
Northeast	0.185	0.386
North Central	0.269	0.440
West	0.181	0.383
Mother's Education Missing	0.007	0.082
Father's Education Missing	0.059	0.235
Family Structure Missing	0.038	0.189
Mother's Labor Force Participation Missing	0.030	0.169
Family Income Missing	0.043	0.202
Family Size Missing	0.016	0.123
Language Use Missing	0.007	0.085
Student's Immigrant Status Missing	0.016	0.126
Mother's Immigrant Status Missing	0.024	0.153
School Mobility Missing	0.018	0.132
School Retention Missing	0.018	0.132
Homework Missing	0.062	0.239

Table B.2
Social Context Predictors of Bottom Mathematics Quartile in Full NELS Model.

Variable	Parameter Estimate	Standard Error	Wald χ^2	$Pr > \chi^2$	Odds Ratio
Intercept	3.6745	0.473	60.3571	0.0001	39.431
Black	0.9389	0.0665	199.5277	0.0001	2.557
Hispanic	0.3996	0.082	23.7473	0.0001	1.491
Other	0.5122	0.1003	26.0847	0.0001	1.669
Female	0.1835	0.0372	24.3883	0.0001	1.201
Mother's Education Less High School	0.1408	0.0581	5.8621	0.0155	1.151
Mother's Education Some College	-0.1193	0.046	6.723	0.0095	0.888
Mother's Education College Graduate	-0.5246	0.081	41.9095	0.0001	0.592
Father's Education Less High School	0.1363	0.056	5.9262	0.0149	1.146
Father's Education Some College	-0.202	0.0485	17.3495	0.0001	0.817
Father's Education College Graduate	-0.4759	0.0692	47.2716	0.0001	0.621
Mother is Single Parent	-0.104	0.0562	3.422	0.0643	0.901
Mother Works Part Time	-0.0548	0.0424	1.6701	0.1962	0.947
Mother Works Full Time	-0.0766	0.0588	1.6977	0.1926	0.926
Family Income (1987 $00,000s)	-0.0368	0.00896	16.887	0.0001	0.964
Number of Siblings	-0.00641	0.0119	0.2891	0.5908	0.994
Mother's Age at Birth of 8th Grader	0.000788	0.00314	0.0629	0.8019	1.001
Family Closure	-0.0717	0.0109	43.6257	0.0001	0.931
Spanish Usually Spoken at Home	0.1933	0.1	3.7365	0.0532	1.213
Language Other than English Spoken at Home	0.1812	0.1169	2.401	0.1213	1.199
Student was Born Outside U.S.	-0.3252	0.1036	9.8579	0.0017	0.722
Mother was Born Outside U.S.	-0.348	0.0845	16.9592	0.0001	0.706
Change Schools More than Once	0.0336	0.0405	0.6868	0.4073	1.034
Ever Held Back	1.3117	0.0432	922.7564	0.0001	3.712
Homework Hours/Week	-0.0498	0.00473	111.0167	0.0001	0.951
Catholic School	0.2939	0.0934	9.9021	0.0017	1.342
Other Private School	0.0204	0.1431	0.0204	0.8865	1.021
Percent on Free Lunch	0.000653	0.00108	0.364	0.5463	1.001
Percent Black	0.00357	0.00111	10.2389	0.0014	1.004
Percent Hispanic	-0.00197	0.00135	2.1403	0.1435	0.998
School Parent Education	-0.2842	0.0378	56.5396	0.0001	0.753
School Homework	-0.0567	0.0139	16.6297	0.0001	0.945
School Income	-0.0166	0.0211	0.621	0.4307	0.983
8th Grade Class Size	-0.00016	0.000191	0.7085	0.3999	1.000
School Closure	-0.1075	0.0364	8.7057	0.0032	0.898
Urban	-0.00196	0.0525	0.0014	0.9702	0.998
Rural	-0.0513	0.0485	1.118	0.2904	0.95
Northeast	-0.0146	0.0565	0.0667	0.7962	0.986
North Central	-0.056	0.0505	1.2305	0.2673	0.946
West	0.2337	0.0586	15.9038	0.0001	1.263
Mother's Education Missing	0.3715	0.2194	2.8667	0.0904	1.45
Father's Education Missing	0.2077	0.0773	7.2253	0.0072	1.231
Family Structure Missing	0.189	0.0876	4.6535	0.031	1.208
Mother's Labor Force Participation Missing	0.1462	0.1095	1.783	0.1818	1.157
Family Income Missing	-0.0878	0.0907	0.9376	0.3329	0.916
Family Size Missing	0.0501	0.172	0.0849	0.7707	1.051
Language Use Missing	0.4007	0.1965	4.1571	0.0415	1.493
Student's Immigrant Status Missing	0.1932	0.1885	1.0506	0.3054	1.213
Mother's Immigrant Status Missing	0.0234	0.1437	0.0266	0.8705	1.024
School Mobility Missing	0.2777	0.2204	1.5872	0.2077	1.32
School Retention Missing	0.1387	0.2252	0.3793	0.538	1.149
Homework Missing	0.3413	0.0686	24.7244	0.0001	1.407

Table B.3
Social Context Predictors of Bottom Mathematics Quartile in NAEP-Like Model

Variable	Parameter Estimate	Standard Error	Wald χ^2	Pr > χ^2	Odds Ratio
Intercept	4.2132	0.4013	110.2047	0.0001	67.573
Black	0.9922	0.0632	246.6833	0.0001	2.697
Hispanic	0.3823	0.0789	23.4781	0.0001	1.466
Other	0.3705	0.0928	15.9414	0.0001	1.448
Female	0.0103	0.0352	0.0856	0.7699	1.01
Mother's Education Less High School	0.2782	0.0554	25.2263	0.0001	1.321
Mother's Education Some College	-0.1407	0.0442	10.1191	0.0015	0.869
Mother's Education College Graduate	-0.6564	0.0781	70.5748	0.0001	0.519
Father's Education Less High School	0.2293	0.0536	18.3267	0.0001	1.258
Father's Education Some College	-0.2231	0.0466	22.9069	0.0001	0.8
Father's Education College Graduate	-0.647	0.0658	96.5734	0.0001	0.524
Mother is Single Parent	0.0344	0.0527	0.4268	0.5136	1.035
Mother Works Part Time	-0.1026	0.0405	6.4185	0.0113	0.902
Mother Works Full Time	-0.146	0.0565	6.6768	0.0098	0.864
Spanish Usually Spoken at Home	0.0464	0.0935	0.2463	0.6197	1.047
Language Other than English Spoken at Home	0.0577	0.1089	0.2807	0.5963	1.059
Homework Hours/Week	-0.0514	0.00458	125.9376	0.0001	0.95
Catholic School	0.0736	0.0789	0.8697	0.351	1.076
Other Private School	-0.1504	0.1293	1.3524	0.2449	0.86
Percent on Free Lunch	0.00135	0.00102	1.7381	0.1874	1.001
Percent Black	0.00344	0.00104	10.8733	0.001	1.003
Percent Hispanic	-0.00383	0.00127	9.0328	0.0027	0.996
School Parent Education	-0.3536	0.0293	146.0277	0.0001	0.702
School Homework	-0.0512	0.0131	15.2531	0.0001	0.95
Urban	0.091	0.0489	3.4653	0.0627	1.095
Rural	-0.0874	0.0437	3.9924	0.0457	0.916
Northeast	-0.0959	0.0533	3.2379	0.072	0.909
North Central	-0.1174	0.0475	6.1079	0.0135	0.889
West	0.1459	0.0555	6.9211	0.0085	1.157
Mother's Education Missing	0.255	0.2107	1.4648	0.2262	1.29
Father's Education Missing	0.2495	0.0745	11.2045	0.0008	1.283
Family Structure Missing	0.2901	0.0838	11.98	0.0005	1.337
Mother's Labor Force Participation Missing	0.3318	0.104	10.1816	0.0014	1.393
Language Use Missing	0.4929	0.1852	7.0798	0.0078	1.637
Homework Missing	0.4977	0.0653	58.1105	0.0001	1.645

Appendix B.4

Individual-Level Correlations Among Selected Family Characteristics in NELS (N=20,055)

Family Measure	(1)	(2)	(3)	(4)	(5)	(6)
(1) Income	1.00					
(2) Mother's Education	.34	1.00				
(3) Father's Education	.40	.59	1.00			
(4) Family Size	-.19	-.17	-.17	1.00		
(5) Mother's Age at 8th Grader's Birth	.12	.09	.09	.11	1.00	
(6) Family Closure	.19	.23	.21	-.11	.08	1.00

Appendix B.5

Correlations Among Selected School Measures in NELS.

School Measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Income	—	.76	-.54	.42	.39	-.28	-.22	-.37	-.05
(2) Parent Education	.71	—	-.62	.39	.47	-.24	-.39	-.46	-.02
(3) Free Lunch	-.46	-.58	—	-.22	-.46	.44	.46	.59	.08
(4) Average Homework	.36	.32	-.25	—	.23	-.08	-.15	-.16	-.18
(5) Average Closure	.32	.45	-.34	.29	—	-.38	-.38	-.56	-.44
(6) Percent Black	-.25	-.26	.27	-.09	-.42	—	-.08	.75	.14
(7) Percent Hispanic	-.14	-.28	.19	-.11	-.26	-.04	—	.60	.17
(8) Percent Black or Hispanic	-.29	-.38	.34	-.14	-.51	.81	.55	—	.23
(9) Class Size 8th Grade	-.07	-.16	.21	-.17	-.36	-.17	.16	.24	—

Notes: School-level correlations appear below the diagonal (N=991), and student-level correlations appear above the diagonal (N=20,055).